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# PHYTOLOGIA

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# A NEW SPECIES AND NEW COMBINATION IN MEXICAN *SEDUM* (CRASSULACEAE)

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

A new species of *Sedum*, ***S. hintoniorum*** B.L. Turner, is described from southern Nuevo León and closely adjacent Tamaulipas, and *S. rhodocarpum* subsp. *edwardsii* R.T. Clausen is elevated to specific rank as ***S. edwardsii*** (R.T. Clausen) B.L. Turner, *comb nov.* An account of their relationships to closely related taxa is given, and a map showing their distributions is presented.

KEY WORDS: Crassulaceae, *Sedum*, México, Nuevo León, Tamaulipas

Routine identification of plants from northeastern México has revealed the following novelty.

***SEDUM HINTONIORUM*** B.L. Turner, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Zaragoza, Cerro Viejo, 2085 m, 1 Oct 1993, *Hinton et al. 23797* (HOLOTYPE: TEX!; Isotypes: GH!,MEXU!).

*Sedo caduco* R.T. Clausen similis sed differt caulibus non sigillatim papillosis, foliis viridibus (vs. rubescentibus), petalis lanceolatis (vs. cucullatis ad apicem), et antheris purpurascentibus (vs. flavidis).

Ascending to recumbent perennial herbs 15-20 cm high. Roots forming fusiform tubers 1-2 cm long, 0.2-0.5 cm across. Lower stems suffruticose, glabrous, the epidermal cells elongate but bulging; upper stems and branches of inflorescence similar to the lower but upon drying seemingly winged, the uppermost portions appearing subpapillose. Leaves alternate, oblanceolate, those at midstem ca. 2 cm long, 0.4 cm wide, glabrous, smooth. Flowers arranged in terminal, relatively open, paniculate cymes 3-5 cm across and about as wide, or else arranged in leafy 1-sided flowering branches. Sepals 5, unequal, free, ovate-lanceolate to oblanceolate, 2-4 mm long. Petals 5(-4), 4-6 mm long, 1-2 mm wide, broadly lanceolate, the upper portion often with a green or rosy mid-rib, the apices decidedly acute, reflexing at maturity.

Nectaries much-reduced, reniform, white. Stamens ca. 5 mm long, the anthers purple or purplish. Pistils 4-5 mm long, erect to somewhat spreading at maturity, the beak ca. 1.5 mm long. Seeds ovoid, ca. 0.7 mm long, brown, minutely papillose.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Nuevo León: Mpio. Aramberri, Cerro Viejo, 2485 m, 20 Nov 1993, *Hinton et al. 23981* (TEX). Mpio. Galeana, Agua Blanca to San Miguel, 1985 m, 28 Aug 1991, *Hinton et al. 21297* (TEX). Mpio. Zaragoza, Cerro Viejo, 1935 m, 6 Oct 1992, *Hinton et al. 22455* (TEX). Tamaulipas: Mpio. Hidalgo, Arroyo Oscuro, 2 rd. mi NE of Paraje Los Caballos, 1800 m, 23 Sep 1994, *Nesom 7500* (TEX).

*Sedum hintoniorum* occurs in pine-oak woodlands from 1800-2100 m where, according to label data, it forms colonies on bare boulders or exposed rocky places. The specimen from Tamaulipas (growing in humid woods with *Carya* spp., *Cornus*, *Carpinus*, and *Dirca*) differs somewhat in possessing smaller flowers (these obviously immature).

In Clausen's 1984 account of *Sedum* for the Mexican Cordillera, flowering specimens of *S. hintoniorum* will key to or near *S. caducum* R.T. Clausen, a white-flowered species known only from type material collected in Tamaulipas, México, near Ciudad Victoria at 610 m. His description of the habit (stiffly erect), stems (papillose), leaves ("prominently speckled with red and appearing reddish"), inflorescence (2-3 parted cymes with 2-7 flowers), petals hooded at apex, basal fusion of petals (0.8 mm), anther color ("pale yellow to pale carmine"), differs markedly from the species described here.

It is a pleasure to name this distinctive species for the remarkable G.B. Hinton (and his extended family), the latter having assembled most of the specimens cited herein. I am well aware that there already exists a *Sedum* with the name *S. hintonii* R.T. Clausen, named for the late G.B. Hinton (1882-1943), fount of this clan and father of Jaime and grandfather of George (collectors of the present taxon). But such an extraordinary lineage, in my opinion, is fully deserving of the apellations concerned, as well documented in Hinton & Hinton (1995) showing their collecting activities in northeastern México.

***SEDUM EDWARDSII*** (R.T. Clausen) B.L. Turner, *comb. & stat nov.* BASIONYM: *Sedum rhodocarpum* Rose subsp. *edwardsii* R.T. Clausen, *Sedum Mexic. Cordill.*, Plat. 7. 1981.

As noted by Clausen, who treated the taxon as a subspecies of *Sedum rhodocarpum*, *S. edwardsii* is closely related to *S. rhodocarpum* but differs in numerous characters, including leaf shape and vestiture; the latter character is especially diagnostic, all of the collections listed below possessing pilose stems and foliage, while *S. rhodocarpum* is completely glabrous.

The following collections of *Sedum edwardsii* have come to the fore since Clausen's description of the taxon. MEXICO. Tamaulipas: Mpio. Hidalgo, Los Caballos, 1705 m, 21 Sep 1994, *Hinton et al. 25143* (TEX); El Mirador, 895 m, *Hinton et al. 25147*; 11.4 mi E of Dulces Nombres, 0.3 road mi W of Paraje de Los Caballos, 1840 m, 21 Sep 1994, *Nesom 7456* (TEX).

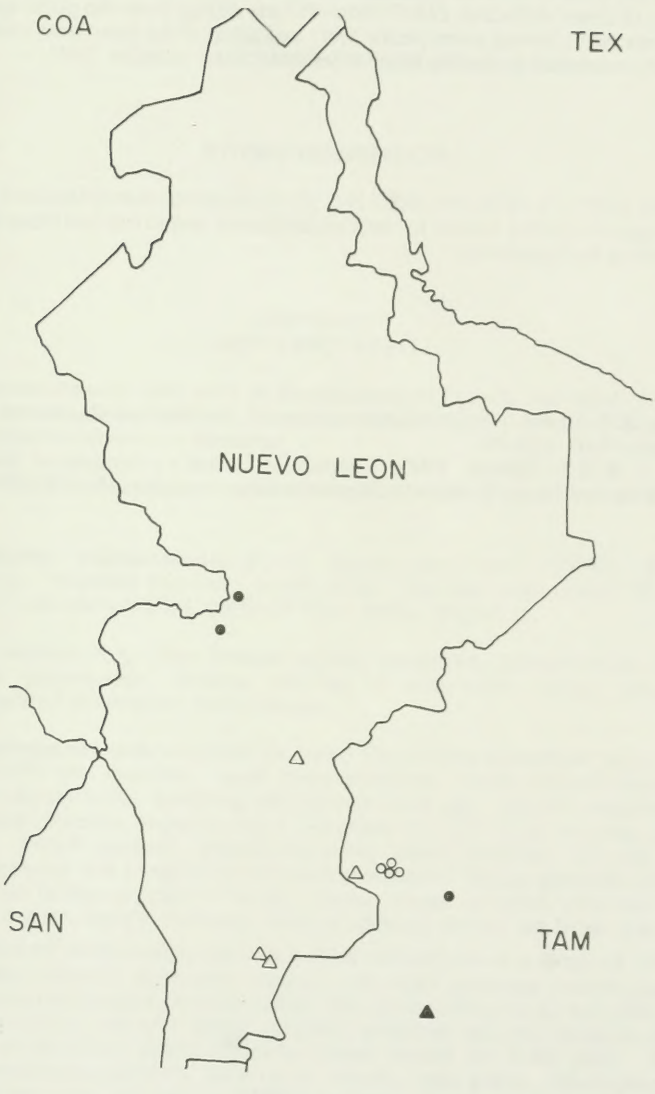


Figure 1 Distribution of *Sedum* spp: *S. caducum* (solid triangle); *S. hintoniorum* (open triangles); *S. edwardsii* (open circles); *S. rhodocarpum* (closed circles).

None of these collections contained material referable to *Sedum rhodocarpum*, however, Hintons' collection *25147* (from 857 m) differs from the other specimens listed in reportedly having green petals. Only two plants of the latter were observed at the locality concerned, according to the collectors.

## ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis, and to him and Mark Mayfield for reviewing the manuscript.

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*Phytologia* (June 1995) 78(6):409-416.

# TWO NEWLY DESCRIBED CYCADS FROM AFRICA

P. J. H. Hurter

Lowveld National Botanical Garden, P. O. Box 1024, NELSPRUIT, 1200, Republic of South Africa.

## ABSTRACT

Recent intensive field study of *Encephalartos* in Uganda and South Africa reveal two overlooked species. The nature of these entities, their distribution, and conservation status is discussed.

KEY WORDS: *Encephalartos*, new species, Zamiaceae

***Encephalartos nubimontanus*** P.J.H. Hurter, *spec. nov.* TYPE: SOUTH AFRICA. Northern Province: 1,000 m alt., (leaf and male cone). 27 March 1995, *P.J.H. Hurter 95R/1.* (HOLOTYPE: PRE). (Figure 1).

*E. cupidus* R.A. Dyer frondes rigidae, pungentes, glaucas similis sed plantae arborescentes; frondes recurvae et subsessiles; foliola falcata; microsporophylla demissa; bullae labiatae.

Plant arborescent, suckering from the base. Trunk often decumbent, up to 2.5 m long, 350-400 mm diameter. Leaf bases persistent, crown slightly tomentose. Cataphylls velvety white, becoming sub-glabrous with age. Leaves numerous in a dense crown, apically recurved, rigid, glaucous, 1.1-2.0 (1.4) m long, pinnae ascendant. Petiole apparent, slightly trigonous, basally bulbous, 230 mm long, slightly tomentose with a reddish brown collar at maturity. Rachis glabrous, round in cross-section, becoming yellow with age. Pinnae dentate or entire, veins not raised abaxially, margins slightly thickened, inflexed, directed toward the frond apex at an angle of circa 45° to the rachis, opposing leaflets inflexed, set at an angle of circa 70° to each other, oriented incubously towards each other; proximal leaflets gradually reduced to a series of spines; median leaflets 180-250 mm long, 15-25 mm wide, outer lamina edge falcate, narrowly elliptic, gradually acuminate apically, pungent, basally subsessile to the rachis, apices somewhat turned toward the frond apex. Strobili seriate, dimorphous, glabrous; scale facets smooth, light green. Microsporangiate strobili 1-5 per trunk, subconical, 250-400 mm long, 50-90 mm in diameter, stalked on a peduncle 30-45 mm long. Median microsporophylls slightly descending, lamina

oblong, tapering to the base, 11-24 mm wide, 20-30 mm long, 5-10 mm high, margins contracted to the pedicel, bulla with two trapezoidal lateral facets, without median facet but well defined hump-like sagittal ridge; terminal facet a drooping lip-like structure, often slightly crenulate. Megasporangiate strobili 1-3 per trunk, ovoid, 360-400 mm long, 180-200 mm in diameter, with peduncle 360-400 mm long, 180-200 mm in diameter, with peduncle up to 150-310 mm long. Terminal sterile megasporophyll bullae drawn out into ascending lip-like structures. Median megasporophylls rhombic, 40-60 mm wide, 50-60 mm long, and 350-360 mm high. Bulla with two smooth or slightly verrucose trapezoidal lateral facets and a single smooth or slightly verrucose oblong median facet, terminal facet smooth, slightly concave, 3-5 mm deep, lateral ridges slightly drawn out, sagittal crest verrucose, drooping below the pedicel, seminal ridges smooth or slightly sagittate. Seed circa 200 per cone, sarcotesta orange-red, sclerotesta 35-38 mm long, 23-30 mm in diameter, ellipsoidal, round and smooth.

Plants of *Encephalartos nubimontanus* superficially resemble those of *Encephalartos cupidus* R.A. Dyer (Dyer 1971) by their stiff, pungent, glaucous fronds. However, *E. nubimontanus* can at first glance be distinguished from that species by its arborescent habit, robust nature, and long recurved leaves. Vegetatively, *E. nubimontanus* is easily distinguished from *E. cupidus* by its longer, often nearly sessile fronds. In *E. cupidus* the median pinnae are oblong lanceolate, unlike the normally falcate, often marginally dentate pinnae of *E. nubimontanus* (an ecotype that has thus far been observed only in cultivation and not in habitat, produces a lamina dentate to nearly lobed on both sides and is thus not falcate). Cones are also distinctive. The female cones of *E. nubimontanus* have sterile terminal megasporophyll bullae that are drawn out into ascending lip like structures, which is not the case in *E. cupidus*. In the male cones of *E. nubimontanus* the median microsporophylls are slightly descending with bullae drawn out into lip-like structures, while the median microsporophylls of *E. cupidus* are spreading with bullae not drawn out.

Distribution and Habitat: At present this species is known only from one small area in the Northern Province, at an altitude of 1000 m. Plants grow scattered in mixed deciduous woodland, especially on cliff faces.

Material Studied: To protect plants from poachers, precise localities are not given, and grid references are restricted to a 1:250,000 scale. 2430 Pilgrim's Rest: *P.J.H. Hurter 95R/1* (leaf and male cone, PRE, holotype), *95R/2* (leaf and female cone, PRE), *95R/3* (leaf), *95R/4* (leaf), *95R/5* (leaf and male cone), *95R/6* (leaf), *95R/7* (leaf and male cone), *95R/8* (leaf and male cone).

***Encephalartos whitelockii*** P.J.H. Hurter, *spec. nov.* TYPE: UGANDA: Mpanga River Falls, 1,200 m alt. 27 October 1994, *P.J.H. Hurter 94U/3a* (leaf and median section of microstrobilus [HOLOTYPE: PRE]). (Figure 3).

*E. hildebrandtii* A. Br. & Bouché propter folia rigidi, dentati, pungentia similis sed frondes planae, leviter recurvatae; foliola effusa nonsuperposita ad apicem frondes apicem versus; microstrobilis laxus; microsporophylla patentia; megasporophylla demissa.

Plant arborescent, suckering from the base. Trunk up to 3.5 m long (rarely to 4.2 m), 350-400 mm in diameter. Leaf bases persistent. Leaves numerous in a dense crown, apically recurved, rigid, subsessile, green, 3.1-3.4(-4.1) m long. Petiole basally bulbous, to 130 mm long, glabrous. Rachis tomentose, becoming glabrous with age. Pinnae dentate, veins not raised abaxially, margins slightly revolute, spreading, opposing leaflets set at an angle of about 160° to each other, not overlapping, but succubously oriented, proximal leaflets gradually reduced to a distinct series of spines. Median leaflets 230-300 mm long and 20-28 mm wide, narrowly elliptic and falcate, gradually acuminate apically, pungent and subsessile basally, apically somewhat turned towards the frond apex. Strobili seriate, dimorphous, glabrous with smooth scale facets, light green becoming yellow with age. Microsporangiate strobili up to 5 per trunk, narrowly ovoid, 500 mm long and 90 mm in diameter, stalked on a peduncle to 320 mm long. Median microsporophylls rhombic, about 29 mm wide, 32 mm long, and 14 mm high, distinctly with two lateral facets and one median facet, the central facet flat or slightly concave. Megasporangiate strobili 1-3 per trunk, ovoid, 450 mm long, 350 mm in diameter, appearing sessile but with peduncle to 100 mm long, cloaked by cataphylls in the trunk crown. Median megasporophylls descending in appearance, rhombic, with two lateral facets and one central facet, slightly drawn out, seminal fringe slightly verrucose, about 55 mm wide, 40 mm long, and 30 mm high with central facet a third of the horizontal diameter of the bulla. Seed about 400 per cone, sarcotesta orange-red; sclerotesta 30-35 mm long and 25-30 mm in diameter, ellipsoidal, round and smooth.

Diagnostic features and affinities: *Encephalartos whitelockii* superficially resembles *E. hildebrandtii* A. Br. & Bouché (Melville 1957, 1958) because of its stiff dentate and pungent green leaves. However, even vegetatively it is easily distinguished from this species. In *Encephalartos hildebrandtii* the pinnae are ascending, succubously overlapping and falcate with the apices directed toward the base of the leaf. In *E. whitelockii* the pinnae are spreading, not overlapping, and falcate with the apices directed toward the apex of the leaf. Profound differences are also observable between the strobili. Microstrobili of *E. whitelockii* are pendulous at maturity while those of *E. hildebrandtii* are erect. The microsporophylls of *E. whitelockii* are spreading while those of *E. hildebrandtii* are strongly ascending. The megasporophylls of *E. hildebrandtii* are spreading and the bullae are not drawn into descending structures as with those of *E. whitelockii*.

Distribution: At present this species is known only from one area along the Mpanga River, Western Uganda (Figure 4).

Material Studied: UGANDA: Mpanga River falls, 2 km west of Lake George, *P.J.H. Hurter 94U/5, 94U/3a*.

This species is named for Loran M. Whitelock, horticulturist and cycadologist, who has made most of my recent exploration of central and east Africa possible and who has devoted a life time to cycads.

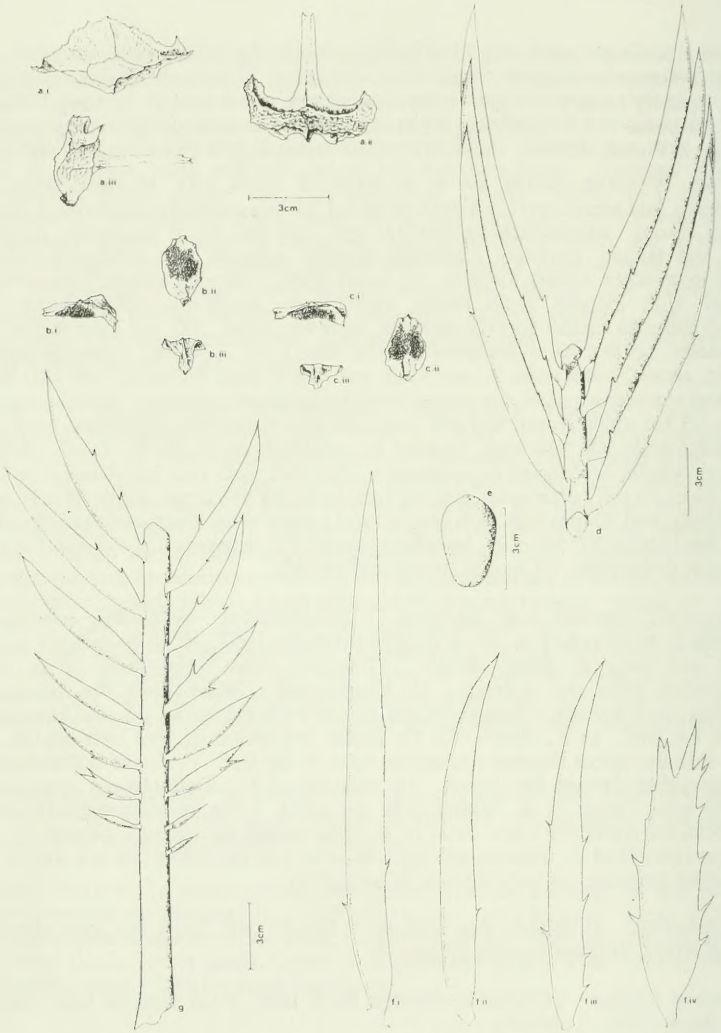


Figure 1. *Encephalartos nubimontanus*: (a) median megasporophyll (*P.J.H. Hurter 95R/2*), (i) frontal view, (ii) adaxial view, (iii) side view; (b) median microsporophylls (*P.J.H. Hurter 95R/5*), (i) side view, (ii) abaxial view, (iii) frontal view; (c) median microsporophylls (*P.J.H. Hurter 95R/8*), (i) side view, (ii) abaxial view, (iii) frontal view; (d) median pinnae (*P.J.H. Hurter 95R/1*); (e) seed (*P.J.H. Hurter 95R/2*); (f. i-iv) a range of pinnae shapes observed within the new species; (g) petiole and proximal pinnae (*P.J.H. Hurter 95R/1*). (del. S. Burrows).

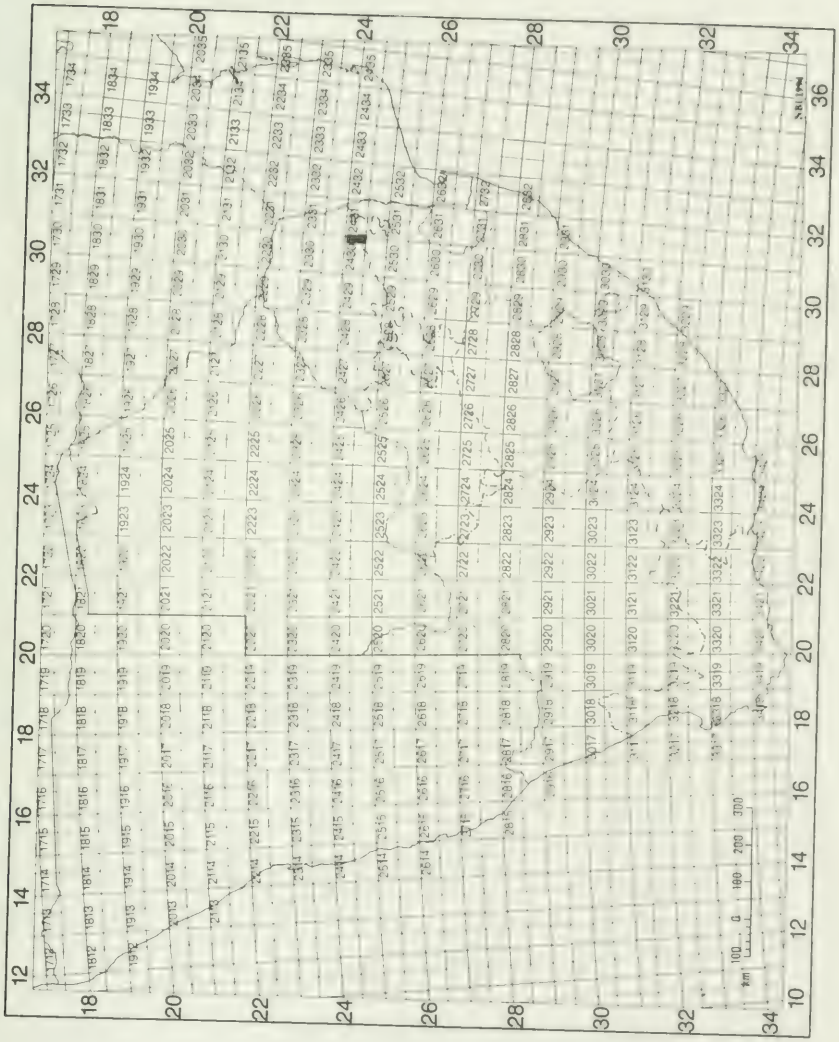

Figure 2. *Encephalartos nubimontanus*: known distribution in South Africa.

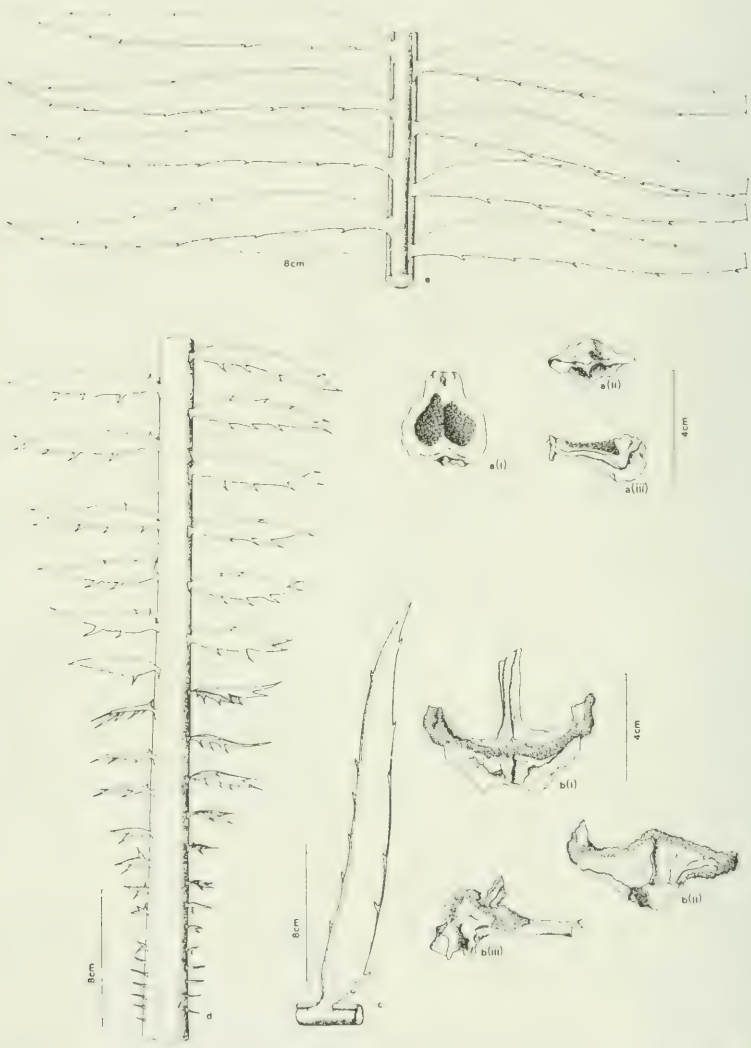


Figure 3. *Encephalartos whitelockii* (a) median microsporophyll (*P.J.H. Hurter 94U/3a*), (i) abaxial view, (ii) frontal view, (iii) side view; (b) median megasporophyll (*P.J.H. Hurter 94U/5*) (i) adaxial view, (ii) frontal view, (iii) side view; (c) median pinna; (d) petiole and proximal pinnae (*P.J.H Hurter 94U/3a*); (e) median section of leaf (*P.J.H. Hurter 94U/3a*).

Figure 4. *Encephalartos whitelockii*: known distribution in Uganda.

ACKNOWLEDGMENTS

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*Phytologia* (June 1995) 78(6):417-427.

# THE RESURRECTION OF A SPECIES; *MUHLENBERGIA STRAMINEA* (GRAMINEAE)

Charlotte G. Reeder & John R. Reeder

Herbarium (ARIZ), 113 Shantz Building, University of Arizona, Tucson, Arizona 85721 USA

## ABSTRACT

*Muhlenbergia straminea*, described by Hitchcock (1913), was recognized as a distinct species until 1935 when he relegated it to synonymy under *M. virescens* (H.B.K.) Kunth, a disposition that has been followed by all subsequent authors. The present study, based on morphology, distribution, and time of flowering presents strong evidence for the recognition of *M. straminea* as a species distinct from *M. virescens*. Although quite unexpected, we believe it is highly significant that meiosis occurs in the anthers of *M. straminea* in the autumn preceding flowering the following spring.

KEY WORDS: Gramineae, *Muhlenbergia straminea*, *M. virescens*, *M. curvula*, *M. quadridentata*, México, southwestern U.S.A.

Continuing field and herbarium studies, along with examination of type specimens, have revealed the need to re-evaluate certain members of the *Muhlenbergia montana* complex. This group includes species most easily recognized by the 3-nerved (often 3-toothed and/or 3-awned) second glume and lower sheaths which become flat, somewhat papery, and no longer invest the culm. A number of species, most of which occur in México, make up this taxonomically puzzling assemblage of both annual and perennial grasses. Of immediate concern is the perennial *M. virescens*, a taxon said to range from Central México to Arizona and New Mexico, U.S.A. The species is based on *Podosaemum virescens* H.B.K. (1816), which was described from a plant collected by Humboldt & Bonpland in 1803 in the state of Guanajuato, México: "Crescit locis asperis, excelsis regni Mexicani prope Santa Rosa de la Sierra et Puerto de Varientos, alt. 1350 hexap. [ca. 2400 m]. Floret Septembri." The type specimen (P!) is fragmentary, consisting of a segment of culm with an inflorescence partially included in the upper sheath, another short section of culm with leaf attached, and a separate leaf. Written on the sheet is the locality, "S. Rosa." The description is quite ample, and along with the type specimen, gives an adequate conception of the species. Numerous specimens (including our own) collected in the mountains of Guanajuato can be determined as this species with little difficulty. The

transfer to *Muhlenbergia* was made by Trinius (1824), some five years before Kunth (1829) as cited by Hitchcock (1913, 1935, 1935a, 1951). Prior to 1913, Trinius was given as the authority for this transfer. It is noteworthy that Kunth (1833) recognized the Trinius combinations.

There has been, and continues to be, confusion regarding the range of *Muhlenbergia virescens*. Roemer & Schultes (1817), Hemsley (1885), and Fournier (1886) repeat the distribution as given in H.B.K. (1816), which suggests that the species is confined to Central México. Fournier often cited other collections but here listed only the type number. Hemsley's work, based largely on Fournier, included no additional information.

Meanwhile Scribner (1882) published a detailed list of grasses collected by C.G. Pringle in Arizona and California during the summer of 1881. Included (p. 88, 89) is: "32. *Muhlenbergia virescens*, Trin., *Unifl.*, 193; Kunth, *Enum. Pl.* i, 202, et *Suppl.* 160; *Podosaemum virescens*, H B K., *Nov. Gen.*, i, 132; *Trichochloa virescens*, R. & S., *Syst.*, ii, 389." One finds (p. 88, 89) a rather lengthy description of a plant collected on "Summits of the Santa Rita Mts., Arizona. . . . This species resembles *M. gracilis* Trin., in habit, but is distinguished at once by its very long involute leaves and light colored, more loosely flowered panicle." [*M. gracilis* sensu Amer. auct. is considered to be *M. montana* (Nutt.) Hitchc. True *M. gracilis* (H.B.K.) Trinius is not a synonym of *M. montana* but a related species.] Lastly this comment (p. 89): "This is a Mexican grass, not before observed in the distributed collections made within the limits of the United States, and perhaps now found for the first time within our limits. It should be added that identification of Pringle's specimens with *M. virescens* Trin., is based upon descriptions of that plant only."

This report by Scribner (1882) of the occurrence of *Muhlenbergia virescens* in the Southwestern United States appears to account for Vasey (1883, 1892), Beal (1896), and subsequent authors having added Arizona and New Mexico to its range. Vasey (1892) included a detailed description of *M. virescens* stating (p. 67): ". . . New Mexico, Arizona, and Mexico." Hitchcock (1913), in Mexican Grasses, indicated that the range of *M. virescens* extended from central México into New Mexico and Arizona. Two years later Wooton & Standley (1915), in their *Flora of New Mexico* cited (p. 72) "18. *Muhlenbergia virescens* (H.B.K.) Kunth" [obviously following Hitchcock 1913], quoting the type locality from H.B.K. The range is given as "Arizona and New Mexico to Mexico." There is no description; however two collections are cited: *Palmer* from northwestern New Mexico, and a *Bigelow* gathering from Ben More (sic!) [a peak near Santa Rita, in eastern Grant County]. A specimen (at US) collected by Edward Palmer *s.n.* [no date] gives only "State of New Mexico."

Hitchcock (1913, p. 301) listed *Muhlenbergia virescens* (H.B.K.) Kunth, *Rév. Gram.* 1:64. 1829. He indicated that it is based on *Podosaemum virescens* H.B.K., and quoted the type locality from the original description. The range, however, includes New Mexico and Arizona. Three collections from México are listed: *Rose 3527* from Sierra Madre, Zacatecas, and two *Parry & Palmer* numbers (*920* and *928* in 1878), both from San Luis Potosí.

Fig. 1. Habits and spikelet details. A, Muhlenbergia virescens, from Scribner (1897); B, M. straminea, from Hitchcock (1951).

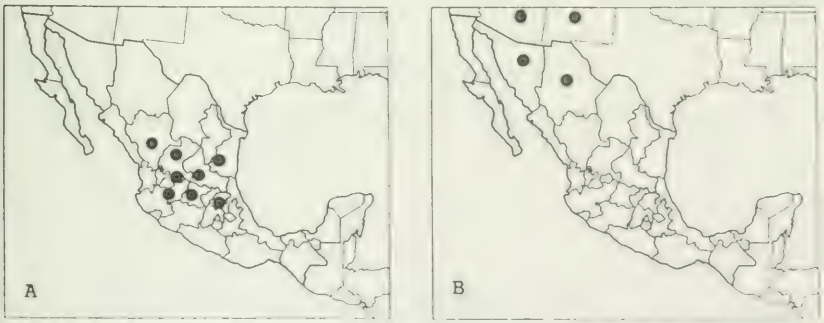


Fig. 2. Distributions of A, Muhlenbergia virescens and B, M. straminea.

TABLE I

Chromosome Numbers for *Muhlenbergia straminea* and *M. virescens* (All collections are *Reeder & Reeder*, with vouchers deposited at ARIZ.)

*Muhlenbergia straminea*

| Collection | 2*n* | Locality |
|---|---|---|
| *6903* | 21 | AZ: Cochise Co., Chiricahua Mts., Rustler's Park Campground. 2530 m 16 Oct. 1977. |
| *6906* | 22 | AZ: Pima Co., Santa Catalina Mts., near Loma Linda Picnic area. 2440 m 18 Oct. 1977. |
| *6907* | 22 | AZ: Pima Co., Santa Catalina Mts., above Geology View Point. 2165 m 18 Oct. 1977. |
| *6908* | 20 | AZ: Graham Co., Graham [Pinaleno] Mts., near Shannon Campground. 2774 m 19 Oct. 1977. |
| *6909* | 21 | AZ: Graham Co., Graham [Pinaleno] Mts., Turkey Flat. 2316 m 19 Oct. 1977. |
| *6910* | 20 | AZ: Cochise Co., Huachuca Mts., Carr Canyon. 2195 m 21 Oct. 1977. |
| *6911* | 20 | AZ: Cochise Co., Huachuca Mts., Carr Canyon. 2255 m 21 Oct. 1977. |
| *6914* | 22, 24 | NM: Grant Co., Cherry Creek Campground, N of Pinos Altos. 2103 m 26 Oct. 1977. |
| *6918* | 20, 21 | NM: Catron Co., S of Luna. 2440 m 27 Oct. 1977. |
| *6922* | 20, 24 | AZ: Navajo Co., N of Indian Pines. 2250 m 27 Oct. 1977. |
| *6924* | 20 | AZ: Coconino Co., San Francisco Mts., on Snow Bowl Road. 2440 m 28 Oct. 1977. |
| *6926* | 20 | AZ: Gila Co., along Old Mogollon Rim Road. 2225 m 28 Oct. 1977. |
| *6928* | 20 | AZ: Gila Co., along Old Mogollon Rim Road. 2440 m 3 Nov. 1977. |
| *6929* | 20 | AZ: Apache Co., SE of Big Lake Campground. 2680 m 4 Nov. 1977. |

*Muhlenbergia virescens*

| Collection | 2*n* | Locality |
|---|---|---|
| *4750* | 20 | MEX: Guanajuato, 9.5 km NE of Ciudad Guanajuato. 2450 m. 19 Oct. 1966. |
| *4751* | 20+1 | MEX: Guanajuato, 27.5 km NE of Ciudad Guanajuato. 2400 m 19 Oct. 1966. |
| *4965* | 40 | MEX: San Luis Potosí, 19.5 km SW of Ciudad San Luis Potosí. 2250 m, 15 Sept. 1967. |

TABLE II

Comparison of morphological features between *Muhlenbergia virescens*, *M. curvula*, and *M. straminea*.

| | *M. virescens* | *M. curvula* | *M. straminea* |
|---|---|---|---|
| Basal sheaths and blades | straight | straight | curling, like wood shavings |
| Blades | involute | involute | flat, becoming involute at tip |
| Blade width | ca. 1.5 mm | ca. 1.5 mm | 2.5--3.5 mm |
| Blade surface | scabrous below, hispid above | scabrous below, hispid above | scabrous below, with tiny spicules between the ribs above |
| Inflorescence color | green or dark green | dark green | yellowish or pale green |
| Glume I | (1.5) 2.0--3.0 (3.5) mm | (2.4) 2.5--3.0 mm | (3.0--3.5) 4.5--5.0 mm |
| Glume II | (3.0--3.5) 4.0--4.5 (5.0) mm | 4.0--4.5 (5.0) mm | (4.0) 4.5--5.5 (6.0-7.0) mm |
| Glume surface | glabrous, shiny, translucent | glabrous, translucent | dull, minutely scaberulous |
| Lemma | (3.0) 3.5--4.0 mm | 3.5--4.0 mm | 4--5 (6) mm |
| Lemma surface | pubescent on lower 1/2--2/3 | pubescent lower 2/3 | pubescent on midrib at base and on margins on lower 1/2 |
| Stamens | 2.0--2.5 (3.0) mm | ca. 2 mm | (2.0) 2.5--3.0 mm |
| Flowering time | Sept.--Oct. | Sept.--Oct. | March--April (May) |

Recent authors, *e.g.* McVaugh (1983), Beetle (1987), and Allred (1993) have continued to include the southwestern United States within the range of *Muhlenbergia virescens*. McVaugh (p. 263) states "Open dry grassy places in sparse oak or oak-pine forest, 1600--2700 m on the Central Plateau and the ranges to the west, flowering Oct--Nov." He includes "S w U.S." as well as various central and western states of México. Beetle (1987) cites "New Mexico and Arizona, south to Michoacán and Mexico." Allred (1993) gives only the distribution within New Mexico.

Hitchcock (1913, p. 302) described as new *Muhlenbergia straminea*, the type collection, *R. Endlich 1210*, 10 April, 1906, from pine and oak woods, Tecorichu, western Sierra Madre, Chihuahua, elev. 2200 m. Two other gatherings from the same general area are cited: *Endlich 1226* and *1210a*, from Tierra Colorada, dated April, 1906. [Hitchcock indicated that the specimens at US are from material sent him by Dr. I. Urban, Berlin Botanical Garden.] There is a rather lengthy description, followed by (p. 302): "This species is distinguished by the stramineous appearance of the glumes and foliage and by the flat, ribbon-like lower sheaths, which withdraw from the culms and become spirally twisted or curled like shavings. The long, papery glumes indicate an affinity with *Triniochloa* but it is distinguished from that genus by the terminal awn of the lemma. It appears to be most nearly allied to *M. longiglumis* [Vasey, G., Contrib. U.S. Natl. Herb. 1:283. 1893]."

*Muhlenbergia straminea* may somewhat resemble *Triniochloa*, however careful examination reveals that the members of the latter genus are characterized by closed sheaths, and lodicules which are often fused and lack vascular traces. Also the leaf anatomy is pooid; in *Muhlenbergia* it is eragrostoid (chloridoid). *Triniochloa* is clearly related to *Melica* and *Schizachne*. [See J.R. Reeder Systematic position of the genus *Triniochloa* (Gramineae). Amer. J. Bot. 55:735. 1968 (abstract).]

*Muhlenbergia longiglumis* is an attractive Mexican species with compressed-keeled sheaths, and long glumes which may be aristate. Soderstrom (1967) included it as a member of § *Epicampes*. *Muhlenbergia straminea* belongs within the § *Podosaemum* as outlined by Soderstrom, and is related to the *M. montana* group of species. In fact when Hitchcock treated the genus in the North American Flora (1935a), he placed *M. straminea* as a synonym of *M. virescens*, but gave no reason for this change. Since the original material of *M. virescens* was collected in central México, and the type specimen of *M. straminea* came from the mountains of northern Chihuahua, it seemed prudent to re-examine these two taxa with respect to the plants which are to be found in Arizona and New Mexico.

Perhaps one of the most striking differences to be noted from the protologues of these taxa is that the original material of *Muhlenbergia virescens* was collected in September; that of *M. straminea* in early April. Anyone familiar with "*M. virescens*" in the mountains of New Mexico and Arizona is aware that it blooms very early in the spring. Another characteristic, perhaps known only to us, is that the flowers are actually initiated in late autumn, at which time meiosis in the microsporocytes occurs. We tried unsuccessfully for several years in early spring to collect young inflorescences for cytological examination. Even though panicles had not yet emerged from the sheath, the anthers were already fully formed and contained mature pollen grains. At this time also, anthers have their characteristic reddish purple color, which is retained in the fixative and in 70% alcohol in which they are stored. Eventually we discovered that good cytological material can be collected in late September to early

November. Numerous good chromosome counts were obtained from collections made in late autumn in various localities in Arizona and New Mexico. The possibility that meiosis might occur in the autumn of the previous year occurred to us when we found plants partially covered with snow in March, many of which had inflorescences exposed, some well exserted from their sheaths! In contrast, we have observed *M. virescens* in full flower from August to October, and at that time have collected young inflorescences in satisfactory condition for cytological examination. Although, as can be seen in Table I, collections for chromosome counts for both *M. virescens* and *M. straminea* were made in the month of October, there is an important difference with respect to the time involved for the completion of flowering. As mentioned above, the initiation of meiosis within the anthers of *M. straminea* takes place in late autumn, and the plants remain dormant during the winter, blooming in early spring of the following year. In the case of *M. virescens*, meiosis occurs in late summer or autumn, and the plants bloom soon after in the same season.

In 1951 little was known regarding the flowering habits of this southwestern grass. In Gould (1951), C. Reeder (p. 211) made the following comment: ". . . flowering March to June and occasionally again in the summer and fall. New Mexico and Arizona to central Mexico. An interesting forest bunchgrass, closely related to the widespread and variable *Muhlenbergia montana* complex but rather unique in its spring-flowering habit and conspicuous with its peculiarly coiled leaves [and sheaths] and strikingly colored anthers." Obviously the idea that it may flower in late summer or fall arose from the early emergence of next-year's panicles. ARIZ has at least one such specimen, *L.N. Goodding M-314* (ARIZ-55284) from the Huachuca Mts., Cochise Co., Arizona, 5 Nov 1937. It is worth noting that specimens of this southwestern species collected after late April ordinarily consist of empty glumes with few or no florets. Even at this stage, the plants can usually be identified by their characteristic glumes and curling foliage.

It is true that *Muhlenbergia virescens* and *M. straminea* share certain characteristics, *e.g.*, both are commonly to be found in oak or pine-oak forests in the higher mountainous areas of México and southwestern USA (mostly between 1900 and 2800 m); a fragile hyaline ligule commonly 10 to 20 mm long; subequal long acute or acuminate glumes, the first 1-nerved, the second 3-nerved; and narrow somewhat contracted panicle. There are, however, a number of morphological differences which serve to distinguish these species even on herbarium sheets (Table II).

Swallen (1950) described as new *Muhlenbergia curvula*, which he appears to have compared to *M. virescens* based on the northern element (*M. straminea*). This is not surprising since the descriptions of *M. virescens* in North American Flora (1935a) and Hitchcock's *Manual* (1935, 1951), as well as the illustration in the latter work, are based on the northern plants. In the *Manual* the figure of this species (1935, fig. 785; 1951, fig. 566) is drawn from *Palmer 565* in 1890 collected at Willow Springs, Navajo Co., Arizona. The type specimen of *M. curvula* came from México: Guanajuato: "12 miles from [Cd.] Guanajuato on road to Santa Rosa," Sept. 30, 1946 *H.E. Moore Jr. 1353* (US-1963089!). Since the Moore specimen fits well within *M. virescens*, we consider *M. curvula* Swallen and *M. virescens* (H.B.K.) Trinius to be synonyms. Further justification for this change is the fact that the type collections of both species came from essentially the same area in Guanajuato, México.

Of particular interest is *Parry & Palmer 920* in 1878 (US-995807) from San Luis Potosí area, México, elevation 6,000--8,000 ft., on which one finds in Mrs. Agnes Chase's script: "Like HBK type of *Pod.* [*Podosaemum*] *virescens*." This specimen does, indeed, resemble the type of the Humboldt & Bonpland collection (P!), but in no way resembles *M. virescens* as illustrated in Hitchcock's *Manual* (1935, 1951). (fig. 1,B). Scribner (1897, fig. 110, p. 128) in *American Grasses-Illustrated* has a sketch of *M. virescens* which is quite consistent with the type, although his comment below the figure gives: "At an altitude of 1800 to 2400 m on the mountains of Arizona and New Mexico. Mexico. May, June." (fig. 1,A). Although the figure fits our concept of *M. virescens*, the range given for the species includes *M. straminea*, but he has noted the early flowering of the southwestern material. In 1891 Vasey reported on grasses collected by Dr. Edward Palmer in western México and Arizona. On p. 114 one finds "*Muhlenbergia virescens* Trin." from "Near the summit of the mountain Alamos." March 26 to Apr. 8. 1890. US has four sheets of this number; all prove to be *Muhlenbergia straminea*. This species has been collected more recently from about the same locality in Sonora, México, by *V.W. Steinman & M. Baker 9373* on March 11, 1993 (ARIZ). Other collections from the mountainous areas of Sonora and Chihuahua have appeared within recent years. For the distribution of these two species see Figure 2.

Of the new species recently described by Y. Herrera (1987, 1992) from México only one appears to pose any problem of separation from *Muhlenbergia straminea*. The type of *M. durangensis* came from Mpio. Mezquital, state of Durango, and like *M. straminea* flowers early in the spring. However, it may be distinguished by its very short truncate ligule (0.7--1.0 mm long) which has short acute projections from the sheath on either side. Further, the spikelets tend to be larger (5.0--6.5--7.0 mm long), and anthers mostly 3.0--3.5 mm long. The other species (*Muhlenbergia cualensis* and *M. michisensis*) differ in having only one nerve in the second glume. In both *Muhlenbergia virescens* and *M. straminea* the second glume is distinctly 3-nerved.

In a recent paper, Herrera & Grant (1993) consider the correlation of morphological and flavonoid data within the *Muhlenbergia montana* complex as generated by the DELTA system. The discussion does not instill great confidence, *e.g.* one finds the repetition of three separate collections under two different species. Further, the inclusion of *M. argentea* Vasey within this complex is puzzling. Even though Vasey (1886) in the original description of *M. argentea* stated that the upper "empty glume" is "three-toothed at the apex," Beal (1896, p. 232) described the glumes of *M. argentea* as "subequal, linear-lanceolate, the apex more or less 2-toothed, 1-nerved." Hitchcock (1935a, p. 465) described the same species in some detail, basing his description on the type material, which was all that was available at the time. The glumes are said to be "about equal, thin, oblong or somewhat notched, the midnerve extending into a mucro or short awn, the summit minutely pubescent or ciliolate." The glumes in specimens of *M. argentea* we have examined fit this description. Whereas the second glume in *M. argentea* may be 3-toothed in some plants, other characteristics do not suggest a relationship with the *M. montana* complex. The sheaths invest the culms and are slightly compressed-keeled; the glumes are 1-nerved; the lemma is deeply bifid; and of special note is the fact that the caryopsis is conspicuously flattened. *Muhlenbergia argentea* clearly is not a member of the *M. montana* complex.

In summary, *Muhlenbergia straminea* Hitchc. is shown to be a species worthy of recognition, and is not conspecific with *M. virescens* (H.B.K.) Trinius. *Muhlenbergia curvula* Swallen is reduced to synonymy with *M. virescens*. To our knowledge, the occurrence of meiosis in *M. straminea* in late autumn, preceding flowering the following spring, is unique among members of the *M. montana* complex.

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Note: The chromosome number of *Reeder 4965* from San Luis Potosí was determined to be $2n = 40$. It is of interest that in this instance meiosis is somewhat irregular with 4 or 5 quadrivalents clearly visible, suggesting that it may be an autotetraploid.

A better understanding of specific features, and the separation of *Muhlenbergia straminea*, reveal that three of our collections for which chromosome counts were reported earlier as *M. virescens* in fact represent the closely related *M. quadridentata* (H.B.K.) Trinius. The specific collections are *4664* and *4475* from Durango (Reeder

1967) and *4703* from Zacatecas (Reeder 1968). *Muhlenbergia quadridentata* may be distinguished by its shorter ligule which tends to be firmer near the base, frequently with vascular traces evident; blades, which are flat becoming involute, are strongly ribbed with tiny spicules on the ribs; and glumes that are dull (scaberulous and may have a few hairs at the base).

A few reports of *Muhlenbergia virescens* in the literature need to be clarified as well. McVaugh (1983) cited *Reeder & Reeder 6437* from Monte Escobida, Zacatecas, as *M. virescens*. Re-examination of the specimen reveals it to be *M. quadridentata*, the lemma of which is pubescent on the lower 1/2 to 2/3. This type of pubescence is the principal character used by H.B.K. (1816) to segregate *Podosaemum gracilis* H.B.K. There is little else to distinguish these plants from their close relative, *M. quadridentata*.

McDonald (1990) listed *Muhlenbergia virescens* in an enumeration of species from alpine-subalpine mountains of northeastern México. He indicated that the grasses were identified by us. Another check, along with the separation of *M. straminea* and *M. virescens*, shows that indeed *McDonald 2045* from the Peña Nevada, Tamaulipas, is true *M. virescens*, whereas *McDonald 2100* from Sierra La Vega, Coahuila, is *M. quadridentata*.

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# *ANEMONE TUBEROSA* (RANUNCULACEAE) IN TEXAS

Marshall Enquist

11511 Metric Blvd. #1033, Austin, Texas 78758 U.S.A.

&

Bonnie Crozier

3411 Spanish Oak Drive, Austin, Texas 78731 U.S.A.

## ABSTRACT

Four species of *Anemone*, all with tuberous rootstocks, occur in Texas: *Anemone caroliniana* Walter; *A. berlandieri* Pritzel; *A. edwardsiana* Tharp; and *A. tuberosa* Rydberg. The recently described species *A. okennonii* Keener & Dutton is treated as within *A. tuberosa* where it is described anew as var. ***texana*** Enquist & Crozier, *var. nov.* A key and distribution maps are provided for the Texas taxa of *Anemone*.

KEY WORDS: Ranunculaceae, *Anemone*, Texas

## INTRODUCTION

*Anemone okennonii* Keener & Dutton (1994) was recently described as a new species endemic to central Texas. Its authors noted (p. 192) it is "taxonomically closest to *A. edwardsiana*" but added the caveat that "whether these two species are closest phylogenetically remains in question." They observed that the geographic range of the new species overlaps with *A. berlandieri* Pritzel but appears to lie isolated between *A. edwardsiana* Tharp and *A. tuberosa* Rydberg. Based on our own field and herbarium experience, however, we believe that the relationship of *A. okennonii* lies with *A. tuberosa*. Earlier botanists, including Donovan Correll, Cyrus L. Lundell, Marshall Johnston, Billie Turner, and Barton Warnock, correctly identified material referable to *A. okennonii* as belonging to *A. tuberosa* (*s.l.*). In addition, we find several misidentified collections that were later correctly annotated as *A. tuberosa* by Marshall Johnston and Lloyd Shinners. In this paper we have attempted to assess the status of *A. okennonii*, especially as regards its relationship to *A. tuberosa* and *A. edwardsiana*. This was accomplished by the examination of numerous populations in

the field as well as a review of herbarium material so as to determine the biological status of each.

## MATERIALS AND METHODS

The authors examined fifteen populations of *Anemone tuberosa* in Crockett, Edwards, Kimble, Sutton, and Val Verde counties, from which more than 300 individuals from seven populations (see Table 1) were studied by Crozier for characters of the sepals and achenes. Including our own collections, we studied approximately 140 sheets of *A. tuberosa* from México, Arizona, New Mexico, and Texas.

## DISCUSSION

Keener & Dutton (1994), relying upon Joseph & Heimberger (1966), assert that the range of *Anemone tuberosa* extends only into "extreme western Texas (El Paso Co.)". However, since the Joseph & Heimberger paper there has been a gradual published acknowledgment that *A. tuberosa* extends much farther east. Warnock (1970) identified *A. tuberosa* as present in Big Bend National Park in Brewster County, Texas. Correll & Johnston (1970) did not originally include *A. tuberosa* in the flora of Texas, but by 1976 Marshall Johnston had annotated numerous sheets in the University of Texas collection as *A. tuberosa* (*Warnock 1205*; *Warnock 442*; *Smith M338*; *Correll, Correll, & Benson 30844*; *Correll & Correll 30884*; *McVaugh 7729*; *Tharp 1800*; *Correll & Flyr 38359*; *Rose-Innes & Warnock 565*; *Warnock 5199*; *Turner & Warnock 273*; *Lundell & Lundell 10176*; and *Worthington 4229*). Johnston (1988 & 1990), in reference to *A. tuberosa*, stated, "The occurrence of this species in Western Texas has been confirmed, including the occurrence in Big Bend National Park and other southern trans-Pecos areas east to the Pecos River." This located the species in Texas as far east as Pecos, Terrell, and Val Verde counties.

Dr. James Henrickson has placed a rough draft of the unpublished "Chihuahuan Desert Flora" in the University of Texas herbarium for corrections and annotations. In its present form, the draft gives the following range information for *A. tuberosa* . . . "Very local in trans-Pecos Texas. (El Paso, Culberson, Brewster, Pecos, Val Verde Cos.); rare in Coah. (Tule Canyon near the Rio Grande), mostly below 1000 meters; Baja C., Calif., Son., Ariz., N.M., Tex., Coah., N.L., early spring, Feb.-Mar."

Recent collections by the authors, in 1995, indicate that *Anemone tuberosa* Rydb. is not limited to trans-Pecos Texas (which is considered to be that part of Texas west of the Pecos River) but also occurs widely in the Edwards Plateau east of the Pecos River in Crockett, Val Verde, Sutton, Kimble, Edwards, and Uvalde counties (see Map 4).

In large part, Keener & Dutton differentiate *Anemone okennonii* by contrasting it with *A. edwardsiana*. We believe that such a comparison is irrelevant. Many

characters of *A. okennonii* that constitute "differences" when compared to *A. edwardsiana* become similarities when compared to *A. tuberosa* (see Keener & Dutton 1994, Table 1, p. 194-195). Of the "differences" that remain, most are the result of incomplete or inaccurate information regarding one or both of the subject species.

Keener & Dutton provided a chart (p. 201) summarizing eleven differences "between *A. okennonii* and other Texas species of *Anemone* with tuberous rootstocks. . . .." Four of the eleven contrasted characters, including leaf division, number of flowers per stem, time of flowering of central and lateral flowers, and sepal number were admitted to be like *A. tuberosa*. One other character, the linear divisions of the bracts, was said to be like *A. berlandieri*, but this would apply also to *A. edwardsiana* or the eastern elements of *A. tuberosa*. This leaves six characters that were said to be unlike those of the other Texas species of *Anemone*. Of these six, we find two, flower size and sepal shape, to be of little use due to the broadly overlapping ranges of these characters in the Texas species. Reddish-glandular leaf margins and tips are not distinctive, but are common to all the Texas species of *Anemone*, particularly in the colder months. Likewise, yellow anthers are common to all the Texas species. We believe that attempts to distinguish subtle shades of yellow are too subjective to be of any value. The two remaining characters, style color and leaf dissection, are also problematic. The lavender-tinted styles of *A. okennonii* were said to be distinctive, but elsewhere in their paper (p. 196) Keener & Dutton stated that the styles of *A. tuberosa* are lavender. Additionally, Keener & Dutton reported that the styles of *A. caroliniana* and *A. berlandieri* are greenish with lavender tips. We believe the last remaining "distinctive" character of *A. okennonii*, the "typically 3-ternate" character of its leaves, results from a misinterpretation of leaf morphology. Despite the assertion that the leaves of *A. okennonii* are "typically 3-ternate", we find no instance in which this is the case, that is, thrice-ternate leaves for this taxon are not only not typical, but are also apparently non-existent. The leaves of *A. tuberosa* in Texas are typically once to twice-ternate (see Figure 1), as are the leaves of *A. tuberosa* in New Mexico, Arizona, Utah, and California. We carefully searched our collections for any leaf that might be considered 3-ternate. The most extreme example of leaf dissection we could find was from a depauperate population infected with black rust found 1.35 miles south of the Llano River on highway 385 in Kimble County. This leaf is illustrated with a line drawing in Figure 1 - H. Close examination of the actual leaf reveals that the margins of the central subleaflet of the central leaflet are continuous, *i.e.*, there is no formation of the petiolules that would be necessary to describe this as a further ternate division. The leaf is smaller than normal, with a reduced surface area, and is probably more deeply incised than normal due to disease stress. None of the other populations we found, which were all healthy, displayed central subleaflets so deeply incised.

Alternatively, we note that the leaves of *Anemone tuberosa* often have lateral leaflets that are asymmetrically ternately divided (see Figure 1, A-G). The two leaves shown in the type drawing of *A. okennonii* (Keener & Dutton 1994, p. 199) apparently are drawn from a collection in which the positions of the central leaflet and a lateral leaflet are transposed, that is, the apparent central leaflets are actually lateral leaflets. This may have contributed to the confusion over the number of ternate divisions.

TABLE 1 -- VARIATION OF SEPAL AND ACHENE CHARACTERS WITHIN AND BETWEEN POPULATIONS OF ANEMONE TUBEROSA VAR. TEXANA.

| Population | sepal number | sepal length (mm) | sepal width (mm) | achene length (mm) | achene width (mm) | style length (mm) |
|---|---|---|---|---|---|---|
| Edwards Co. [Hwy. 377 NE of Carta Valley] | | | | (N=31) | | |
| average | - | - | - | 2.7 | 2.4 | 1.0 |
| std | - | - | - | 0.3 | 0.3 | 0.1 |
| range | - | - | - | 2.0-3.1 | 2.0-3.0 | 0.7-1.2 |
| Val Verde Co. [Hwy. 189 NE of Juno] | (N=41) | | | (N=35) | | |
| average | 8.0 | 14.4 | 4.3 | 2.9 | 2.8 | 1.0 |
| std | 0.5 | 2.2 | 0.9 | 0.2 | 0.5 | 0.1 |
| range | 7-9 | 10.0-19.5 | 3.0-6.0 | 2.5-3.1 | 2.0-3.2 | 1.0-1.1 |
| Val Verde Co. [Hwy. 277 N of Del Rio] | | | | (N=23) | | |
| average | - | - | - | 3.2 | 3.1 | 1.1 |
| std | - | - | - | 0.3 | 0.2 | 0.1 |
| range | - | - | - | 3.0-4.0 | 2.8-3.8 | 0.9-1.3 |
| Crockett Co. [Hwy. 2083 28.7 miles N of Pandale] | (N=25) | | | (N=39) | | |
| average | 8.5 | 12.3 | 3.7 | 3.0 | 3.0 | 1.0 |
| std | 1.3 | 2.4 | 1.0 | 0.1 | 0.1 | 0.1 |
| range | 7-12 | 5.0-18.0 | 2.5-6.5 | 2.7-3.2 | 2.5-3.2 | 0.9-1.2 |
| Crockett Co. [Hwy. 2083 18.2 miles N of Pandale] | | | | (N=40) | | |
| average | - | - | - | 2.8 | 2.3 | 1.0 |
| std | - | - | - | 0.3 | 0.9 | 0.1 |
| range | - | - | - | 2.1-3.3 | 2.1-3.1 | 0.9-1.2 |
| Kimble Co. [Hwy. 385 1.3 miles S of Llano R.] | | | | (N=37) | | |
| average | - | - | - | 2.7 | 2.5 | 1.0 |
| std | - | - | - | 0.3 | 0.5 | 0.1 |
| range | - | - | - | 2.0-3.0 | 1.8-3.2 | 0.7-1.2 |
| Kimble Co. [Hwy. 385 3.2 miles S of Llano R.] | | | | (N=21) | | |
| average | - | - | - | 3.0 | 3.0 | 1.1 |
| std | - | - | - | 0.1 | 0.2 | 0.3 |
| range | - | - | - | 2.8-3.2 | 2.5-3.4 | 0.9-2.2 |

TABLE 2 -- COMPARISON OF ANEMONE TUBEROSA AND ANEMONE EDWARDSIANA.

| | *A. tuberosa* var. *tuberosa* | *A. tuberosa* var. *texana* | *A. edwardsiana* |
|---|---|---|---|
| TUBEROUS ROOTSTOCKS | | | |
| length | 1.5-2 cm | 1-3 cm | 1-1.5(2) cm |
| width | 1.0 cm | (0.7)1(1.2) cm | 0.5-1(1.2) cm |
| BASAL LEAVES | | | |
| dissection | 1-2 ternate | 1-2 ternate | ternate |
| petiole length | 4-10 cm | (3)4-12(16) cm | (3)4-12(20) cm |
| HEIGHT AT ANTHESIS | 1-3 dm | 1-3(4) dm | 1-4(4.5) dm |
| PEDUNCLE | | | |
| pubescence below bracts | glabrous to glabrescent | glabrous to glabrescent | glabrous to glabrescent |
| number of flowers | 1-3 | 1-3 | 1-3 |
| time of flowering | central before lateral | central before lateral | central before lateral |
| BRACT | | | |
| shape | similar to basal leaves but shorter petiole & longer lobes and teeth | linear lobes | linear lobes |
| SEPALS | | | |
| number | 6-13 | 6-12 | 7-13 |
| color | white to pink | white to pink | white |
| shape | linear-oblong | linear-oblong or oblanceolate | linear-oblong or oblanceolate |
| length x width | 20.0 x 3.0 mm | 5.0-19.5 x 2.0-6.5 mm | 5.0-22.0 x 1.5-6.2 mm |
| FRUITING HEAD | | | |
| shape | cylindrical to ellipsoidal | cylindrical to ellipsoidal | cylindrical to ellipsoidal |
| length | 1.5-3.0 cm | 1.5-3.5(4) cm | 1-1.5 cm |
| width | 1.0-1.5 cm | 0.8-1.0(1.2) cm | 0.4-0.9 cm |
| ACHENE | | | |
| pubescence | villous | villous | sparse with hairs on margin and base |
| width | 2.1-4.0 mm | 2.2-3.5 mm | 2.2-3.0 mm |
| STYLE | | | |
| color | violet | violet | yellow-green to green |
| length | 1.5 mm | 0.8-1.6 mm | 0.5-1.4 mm |
| HABITAT | high dry rocky slopes | rocky slopes and grassy flats | shaded canyons to open, rocky slopes |

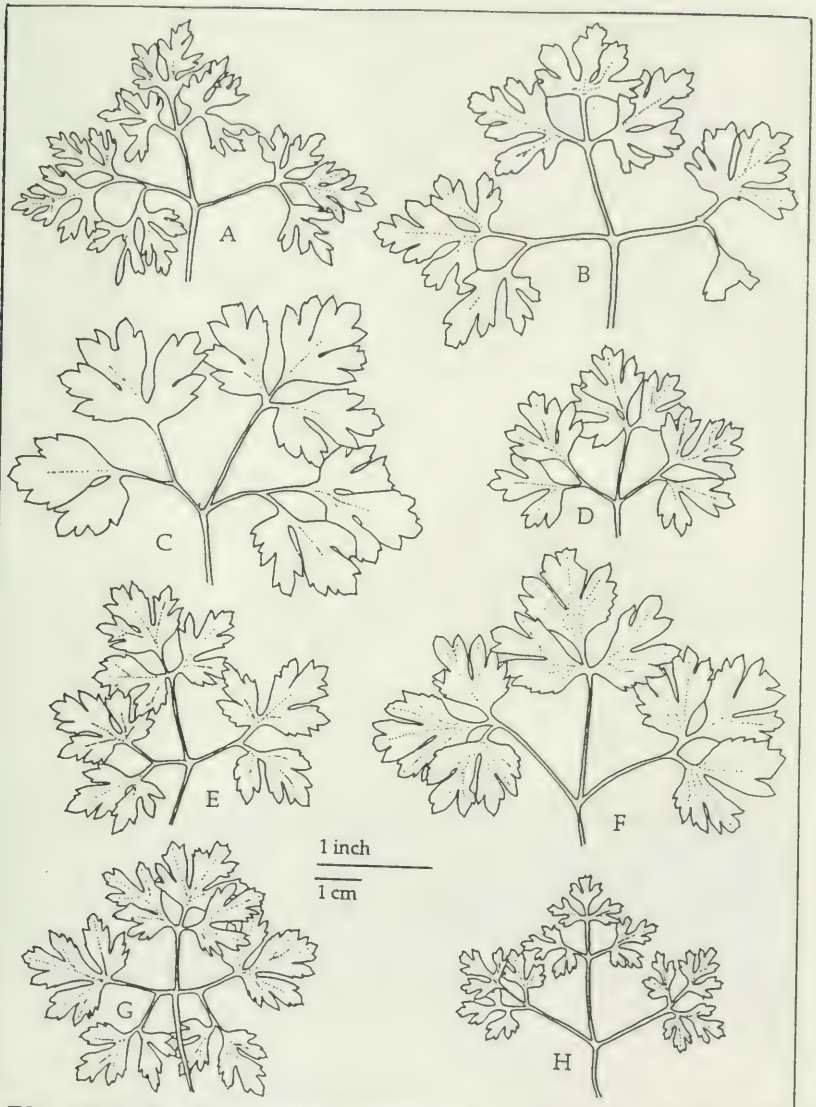



FIG. 1 – LEAF VARIATION IN ANEMONE TUBEROSA. A. New Mexico, Luna Co., Florida Mts, 7 Mar 1897, C.L. Herrick 309 (NMU) B. Texas, Brewster Co., Alpine, 20 Mar 1937, Barton Warnock T205 (TEX-LL) C. Texas, Crockett Co., Ft. Lancaster, 26 Feb 1995, M. Enquist 2710 (TEX-LL) D. Texas, Val Verde Co., Near int. of 277 & 377, 17 Apr 1995, M. Enquist, B. Crozier, & B.L. Turner (TEX-LL) E. Texas, Val Verde Co., 0.8 mi. S of Buckley Crossing on 189, 19 Mar 1995, M. Enquist & B. Crozier 2747 (TEX-LL) F. Texas, Kimble Co., S of Junction, 2 Apr 1995,.M. Enquist 2780 (TEX-LL) G. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 2 Apr 1995, M. Enquist 2776 (TEX-LL) H. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, heavily infected with Black Rust, 2 Apr 1995, M. Enquist 2776 (TEX-LL).

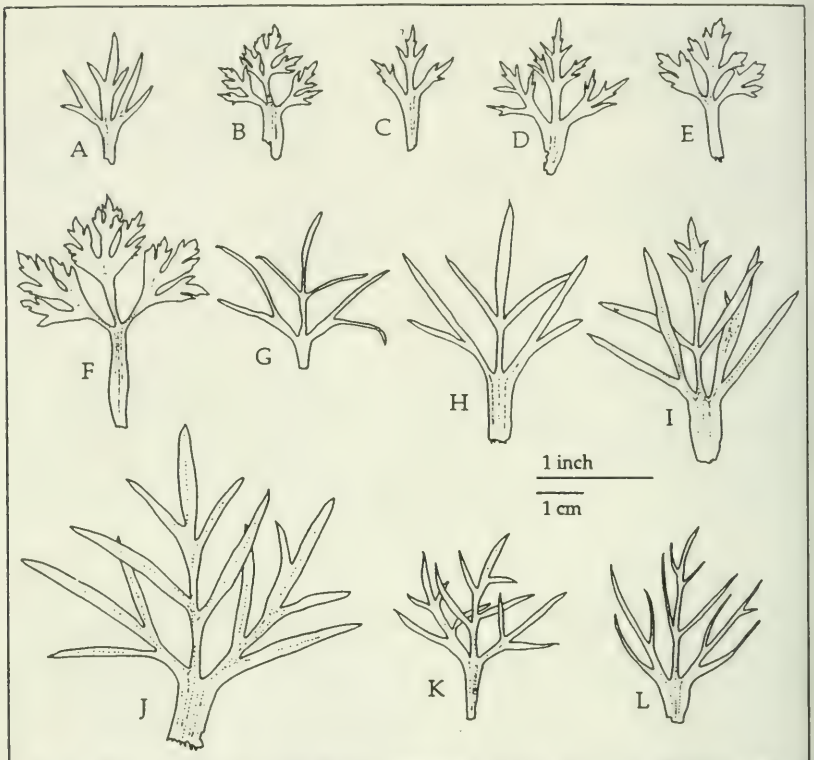



FIG. 2 – BRACT VARIATION IN ANEMONE TUBEROSA. A. Mexico, Nuevo Leon, Villaldama, 15 Mar 1983, Cowan & Nixon 3809 (TEX-LL) B. Arizona, Pinal Co., 1 Mar 1968, Keil, Pinkava, & Lahto 10790 (TEX-LL ) C. Arizona, Pima Co., Ajo Mts., 4 Apr 1948, Fouts 368 (NMU) D. Arizona, Santa Cruz Co., 1 Mar 1986, Ferguson S.N. (TEX-LL) E. New Mexico, Dona Ana Co., Las Cruces, ridge N of Bishop's Cap, 16 Apr 1995, M. Enquist & B Crozier 2799 (TEX-LL) F. Texas, El Paso Co., Franklin Mts., 1 Apr 1979, Worthington 4229 (TEX-LL) G. Texas, Pecos Co., NE of Ft. Stockton, 15 Apr 1941, Lundell 10176 (TEX-LL) H. Texas, Crockett Co, 24 mi N of Pandale, 12 Mar 1995, M. Enquist & B. Crozier 2734 (TEX-LL) I & J. Texas , Val Verde Co., On 277, 1.1 mi S of int of 277 & 377, 17 Apr 1995, M. Enquist & B. Crozier 2802 (TEX-LL) K. Texas, Kimble Co., 3.2 mi. S of Llano River on 385, 17 Apr 1995, M. Enquist & B. Crozier 2804 (TEX-LL) L. Texas, Kimble Co., On 385, 1.35 mi. S of Llano River, 9 Apr 1995, Enquist 2790 (TEX-LL).

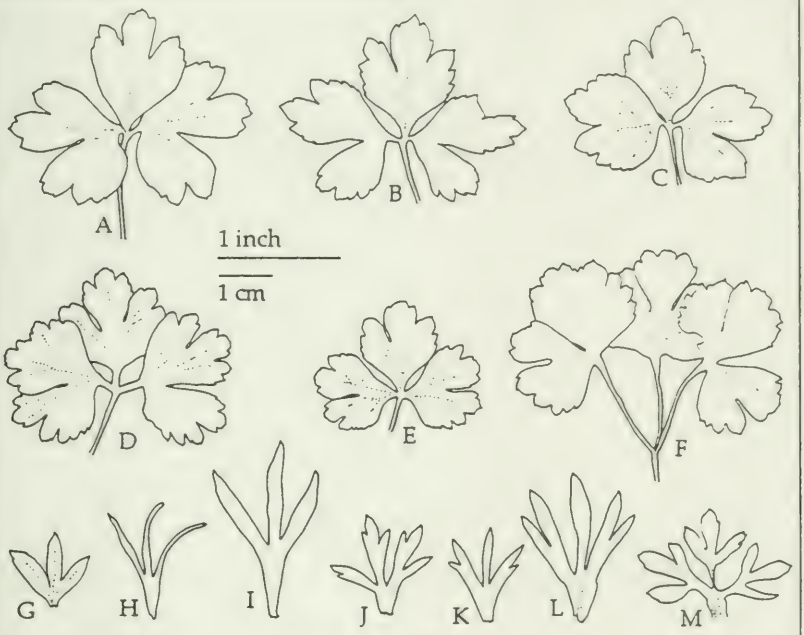
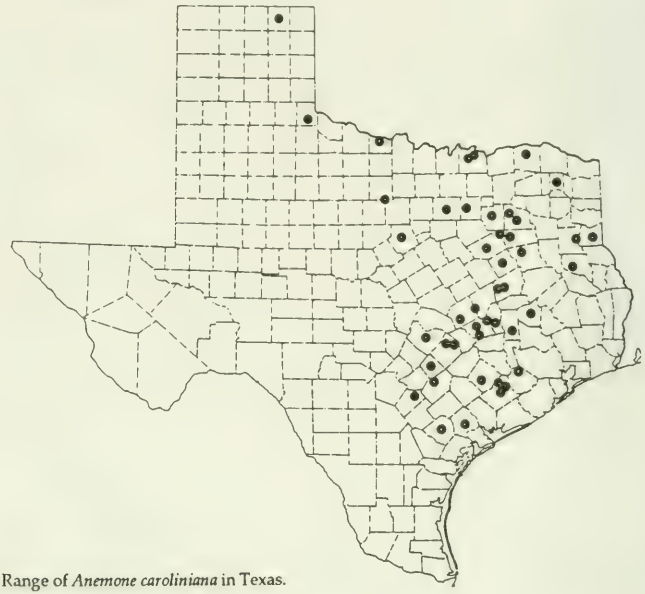
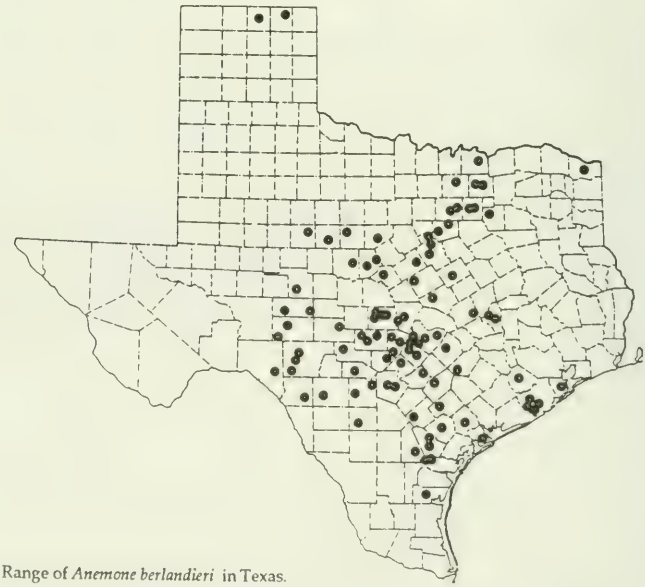



FIG. 3 – LEAF AND BRACT VARIATION IN ANEMONE EDWARDSIANA. A. Texas, Kinney Co., On 674, 0.7 mi S of Edwards/Kinney line, 2 Apr 1995, M. Enquist 2770 (TEX-LL) B. Texas, Val Verde Co., On 1024, 6.8 mi E of int. of 1024 & Pandale Road, 5 Mar 1995, M. Enquist & B. Crozier 2731 (TEX-LL) C. Texas, Crockett Co., Ft. Lancaster, on 290 at roadside park at top of Lancaster Hill, 26 Feb 1995, M. Enquist 2709 (TEX-LL) D & E. Texas, Edwards Co., Towards Barksdale, on 55, 14 mi S of int. of 55 & 377 in Rocksprings, 4 Mar 1995, M. Enquist & B. Crozier 2723 (TEX-LL) F. Texas, Travis Co., Austin, 1 Mar 1937, B. C. Tharp 43999 (TEX-LL) G. Texas, Kinney Co., On 674, 0.7 mi S of Edwards/Kinney line, M. Enquist 2770 (TEX-LL) H. Texas, Crockett Co., Ft. Lancaster, on 290 at roadside park at top of Lancaster Hill, 26 Feb 1995, M. Enquist 2709 (TEX-LL) I. Texas, Edwards Co., Long roadcut on 2523, 1.7 mi N of Edwards/Kinney line, 25 Mar 1995, M. Enquist, B. Crozier, & B.L. Turner 2755 (TEX-LL) J. Texas, Medina co., On 1283, E of Medina Lake, 0.2 to 0.3 mi SE of int. turning off to Mico, 25 Feb 1995, M. Enquist 2704 (TEX-LL) K. Texas, Medina Co., On 1283, E of Medina Lake, 0.4 mi SE of int. turning off to Mico, 4 Mar 1995, M. Enquist & B. Crozier 2716 (TEX-LL) L & M. Texas, Travis co., Paisano Ranch, 21 Feb 1995, B. Crozier 118 (TEX-LL).

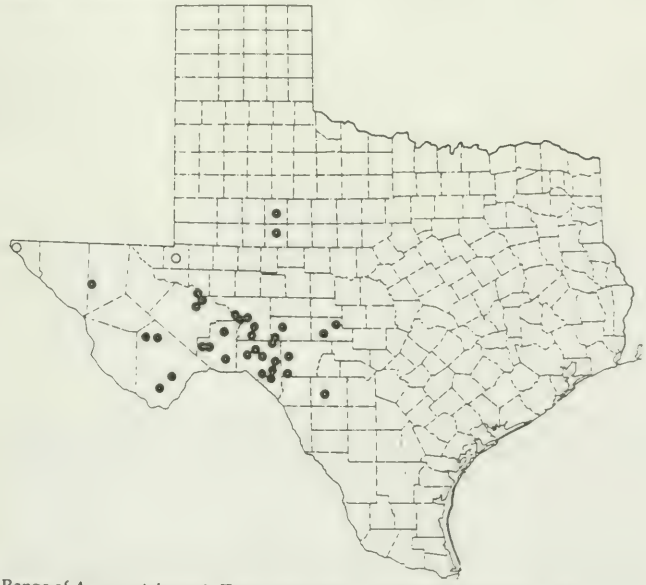


MAP 1 - Range of *Anemone caroliniana* in Texas.



MAP 2 - Range of *Anemone berlandieri* in Texas.

MAP 3 - Range of *Anemone edwardsiana* in Texas.



MAP 4 - Range of *Anemone tuberosa* in Texas. Solid dots = *A. tuberosa* var. *texana*. Open circles = *A. tuberosa* var. *tuberosa*.

We believe that once these putative "differences" are discounted, a comparison of leaf characters, achene size and pubescence, and style color indicates that the type of *Anemone okennonii* clearly fits within *A. tuberosa* (see Table 2).

The obvious differences between *Anemone tuberosa* and *A. edwardsiana* (compare Figure 1 & Figure 2 with Figure 3) may be easily contrasted in the field, where the two are often found in either closely adjacent or intermingled populations. We found the two species growing together in two populations in Val Verde County and two populations in Crockett County. Our collections indicate *A. edwardsiana* ranges from the eastern edge of the Edwards Plateau west to the valley of the Pecos River (see Map 3). We have seen one sheet that appears to be a mixed collection of *A. tuberosa* and *A. edwardsiana* from Brewster County. Although we consider it likely that *A. edwardsiana* is also continuously distributed from the Pecos River west to Brewster County, we were not able to confirm its range west of the Pecos because that area, roughly to Sierra Blanca, was suffering a severe four year drought at the time we made our collections.

Of the nine collections of *Anemone okennonii* cited in the protologue, we interpret seven of them, all made in the 1940's, as typical *A. tuberosa*. The remaining two collections were made by Mr. O'Kennon in 1992 and 1993. Since the type description and illustration of *A. okennonii* do not match the appearance of *A. tuberosa*, we tried to visit the O'Kennon collection sites to determine if these populations were somehow different. The type collection (as published) is said to be from Gillespie County, "high on a shallow roadcut in sandy loam, FM 783, 2 mi S of Doss, 22 Apr 1993". At the stated locality, a closely grazed hillside, we found an abundance of *A. berlandieri* but nothing resembling *A. okennonii* or *A. tuberosa*. The other collection (as published) is said to be from Kimble County, "Hwy 385, 2.5 mi S of Llano River, 9 Mar 1992". At this locality, a gently rolling plain in red sandy loam, we again found an abundance of *A. berlandieri*, but nothing resembling *A. okennonii* or *A. tuberosa*. Repeat visits and careful searches of these localities on an almost weekly basis from mid February through mid April yielded only *A. berlandieri*.

Examination of the holotype (BRIT) and the Kimble County collection (BRIT) offered little additional information about the exact locality of *Anemone okennonii*, but we did note that the type specimen we were shown was heavily infected with black rust. The label for the type locality reads. . . "Gillespie Co.: high on shallow roadcut in sandy loam, along FM 783 at Edwards Creek, 2 miles S of Doss, *Robert J. O'Kennon 11390*, 22 Apr 1993." We found such a roadcut 2.3 miles south of Doss at Edwards Creek but again found nothing resembling *A. tuberosa* or the plant described as *A. okennonii*.

The specimen label for the only other cited collection was similarly brief, reading: "Kimble Co., Hwy 385 2.5 miles So. Llano River. High on shallow roadcut in rocky limestone, *Robert J. O'Kennon 8813*, 9 March 1992." The label data is ambiguous. Although there is a South Llano River, Highway 385 does not cross it. The North and South forks of the Llano River unite in Junction, with the river then flowing northeast towards Highway 385. We conclude that the label intends to indicate a locality 2.5 miles south of the Llano River on Highway 385, as stated in Keener & Dutton (1994). As we have said, this location is a gently rolling plain of red sandy loam, with no roadcut in sight. Here, we did find *Ferocactus setispinus* Engelm., which was listed

as a plant associate of *Anemone okennonii*, but we found no evidence of the latter species. Searching for roadcuts in limestone, we found one at 1.35 miles south of the Llano River with a small population of *A. tuberosa*. About 80% of the plants in this population were heavily infected with black rust, as was the type specimen said to be from Gillespie County. We also found an uninfected population of *A. tuberosa* at another roadcut 3.2 miles south of the Llano River.

We find the label data for the O'Kennon localities, including the type locality, to be inaccurate, confused, and incorrect as to mileages. We also believe there is a strong possibility that the locality of the diseased Gillespie County type specimen is actually the same as that of the diseased population 1.35 miles south of the Llano River in Kimble County.

In this paper, we treat *Anemone okennonii* as a synonym of *A. tuberosa*, but because plants resembling *A. okennonii* cannot be found at the type locality as stated in the label by Mr. O'Kennon for this taxon, and because the infected plants of the type collection seem likely to have been collected in Kimble County rather than Gillespie County, the problematic and ambiguous typification of this taxon cannot serve to establish its identity.

Because we regard *Anemone okennonii* as within *A. tuberosa* but as a distinctive easternmost segment of it, we treat the former at varietal rank. Recognition that *A. tuberosa* extends from El Paso County to central Texas amounts to a 400 mile range extension eastward for the species. The plants of the new variety differ slightly from typical *A. tuberosa*, and we have modified the description of the species to reflect their inclusion.

*ANEMONE TUBEROSA* Rydberg, Bull. Torrey Bot. Club 29:151-152. 1902.
*Anemone sphenophylla* sensu Britton, Ann. New York Acad. Sci. 6:220. 1891. (but see discussion)

Robust, apically villous herbs; stems simple below, usually branched above involucre, 1-4 dm tall at anthesis, from brownish, oblong-obovate tuberous rootstocks 1-3 cm long and 1 cm thick. Radical leaves several, 1-2 ternate; petioles 4-12 cm long. Leaflets 1-2 cm wide, subglabrous, variously parted or cleft, with cuneate obovate segments having acute tips, sessile to petiolulate. Involucral bracts 3, similar to radical leaves in dissection or dissimilar with elongate lobes, reduced, short-petiolate, thinly pilose, positioned above middle of scape at anthesis; secondary branches one or more, 2-bracteate. Flowers 1-several per scape; lateral flowering branches maturing later than central flower; scape villous above involucre, subglabrous below. Sepals 6-13, white to pink, linear-oblong, 5-19 mm long, 2.5-6.5 mm wide, pubescent on the outer side; anthers yellowish-brown, ca. 1 mm long. Fruiting heads cylindrical to ellipsoidal, 1.5-4.0 cm long and 1.0-1.5 cm broad; achenes flat, orbicular, 2-4 mm wide, densely villous; styles reddish-purple to lavender, + or - erect, filiform, 1/3 to 1/2 length of achenes; $2n = 16$ (Joseph & Heimberger 1966).

February to May. High dry rocky slopes and grassy flats, southeastern California, southern Nevada, and southwestern Utah, southeastward through Arizona and New

Mexico to central Texas; south into Baja California, Coahuila, and Nuevo León in México. [description adapted from Keener & Dutton 1994].

*ANEMONE TUBEROSA* Rydberg var. *TUBEROSA*

Specimens examined:

MEXICO. Baja California: On bare rocky E slope of Cerro Matomi, 4 May 1973, *R. Moran 20797* (TEX-LL).

U.S.A. Arizona: Gila Co., Beside Beeline hwy, 14 mi S of Payson, 2 Apr 1960, *N.H. Russell 11352* (BRIT). Maricopa Co., Desert slopes by Apache Trail, 2 mi W of Canyon Lake, 28 Feb 1960, *N.H. Russell 11123* (BRIT); E side of Canyon Lake, 28 Feb 1960, *N.H. Russell 11159* (BRIT); Lake Pleasant Regional Park, 6 Apr 1966, *Moore, Pinkava, & Keil 152* (TEX-LL). Pima Co., Ajo Mts., 4 Apr 1948, *Fouts 368* (NMC); Hills W of Tucson, 17 Feb 1935, *F. Shreve 13163* (BRIT); Rocky hillside near Colossal Cave, Rincon Mountains, 25 Mar 1946, *C. Van Cleve 5* (TEX-LL). Pinal Co., 1 mi N of Peppersauce Canyon, 1 Mar 1968, *Keil, Pinkava, & Lahto 10790* (TEX-LL). Santa Cruz Co., Summit of Fraguita Peak, Cobre Ridge, Coronado Natl Forest, 1 Mar 1986, *G.M. Ferguson s.n.* (TEX-LL). New Mexico: Dona Ana Co., Bishop's Cap, 23 Mar 1935, *Hershey s.n.* (NMC); Tortugas Mts., 14 Mar 1941, *No collector, s.n.* (NMC); West of Organ Mts, 21 Mar 1941, *No collector, s.n.* (NMC); Little Mt., mesa west of Organ Mts., 7 Mar 1900, *E.O. Wooton s.n.* (NMC); Ridge on N side of Bishop's Cap, SE of Las Cruces, 16 Apr 1995, *M. Enquist & B. Crozier 2799* (TEX-LL,TAES). Luna Co., Florida Mts., 7 Mar 1897, *C.L. Herrick 309* (NMC); Hermanas, 18 Mar 1940, *A.L. Hershey s.n.* (NMC). Sierra Co., 1 mi W of Hillsboro, 30 Apr 1904, *O.B. Metcalfe 1558* (NMC). Texas: El Paso Co., E lower slopes of Mt. Franklin, 19 Apr 1952, *Barton Warnock 10409* (SRSC); E slopes of Fusselman Canyon, Franklin Mts., 25 Apr 1973, *Barton Warnock 23688* (SRSC); Slopes below Cottonwood Spring above Tom Mays Memorial Park, W side of Franklin Mts., 6 Apr 1970, *D.S. Correll & D. Flyr 38359* (BRIT,TEX-LL); Franklin Mts. along Trans-Mountain Road near Fusselman Canyon flood control dam, 1 Apr 1979, *R.D. Worthington 4229* (TEX-LL). Winkler Co., 5 mi E of Kermit, 24 Apr 1975, *Barton Warnock 23875* (SRSC).

Since the 1930's, many collections of *Anemone tuberosa* have been made in the western half of Texas. Its variation has not gone unnoticed. As a result, identifications have largely been divided between *A. tuberosa* and *A. sphenophylla* Poepp. We believe taxonomists have divided their identifications between these two names due to the character of the involucral bracts in most of the Texas plants.

Rydberg (1902) described the leaves and involucral bracts of *Anemone tuberosa* as follows ". . . basal leaves with petioles about 5 cm. long, twice ternate; divisions rhombic-cuneate in outline, ternately cleft and toothed; teeth oblong-ovate: . . . involucral leaves similar to the basal ones, but short-petioled and with longer lobes and teeth . . .". He cited specimens from Arizona, New Mexico, Utah, and California which presumably fit his description of a "leafy-bracted" *Anemone*.

Although specimens with involucral bracts fitting the typical elements of *Anemone tuberosa* can be found in extreme West Texas (El Paso County), other plants from

there east to Edwards County have involucral bracts unlike the type description. These plants have bracts with elongate, linear lobes and segments, usually with entire margins but sometimes few-toothed (see Figure 2).

Faced with this variation from the typical elements, many taxonomists in Texas have relied on the interpretation of Britton (1891), who expanded the name *Anemone sphenophylla* to include this taxon of the southwestern U.S. Britton described the leaves and involucral bracts of *A. sphenophylla* as follows: "Radical leaves slender-petioled ternately divided, the divisions obovate, obtuse, cuneate at the base, variously lobed and cleft; leaves of the involucre short-petioled or sessile by a narrowed base, palmatifid into linear or oblong acute segments . . .". This description would seem to better describe the linear-lobed bracts common to *A. tuberosa* in Texas and is the probable reason for the numerous label and annotation identifications of this taxon as *A. sphenophylla*. (We have seen no specimens of *A. sphenophylla* from Chile and do not address the question of whether this name has priority over the name *A. tuberosa*. We note the disjunct occurrence of *A. multifida* Poir. in Chile [Lourteig 1951] and would not be surprised at the disjunct occurrence there of the taxon under discussion in this paper).

Rydberg's description of the bracts of *Anemone tuberosa* was brief and somewhat ambiguous, describing the involucral leaves as similar to the basal ones "but short-petioled and with longer lobes and teeth . . .". When Rydberg described the bracts as being similar to the radical leaves, he may have had in mind bracts such as those in Figure 2 B, E, & F, as well as those with "longer lobes and teeth" exemplified by Figure 2 C & D. We believe the bracts illustrated in Figure 2 C & D represent an intermediate morphology between the western and eastern elements of *A. tuberosa*. In a comparison of specific individual plants, the difference between Figure 2 D (Santa Cruz Co., Arizona) and Figure 2 K (Kimble Co., Texas) is one of degree only.

We feel it is useful to contrast the western and eastern populations of *Anemone tuberosa*; those in Arizona are predominantly "leafy bracted" while those in most of the Texas range have bracts that are not "leafy bracted" but instead are predominantly elongately lobed. We propose that the name *Anemone tuberosa* var. *texana* be applied to those plants with elongately lobed bracts that are dissimilar to the radical leaves.

***ANEMONE TUBEROSA*** Rydberg var. ***TEXANA*** Enquist & Crozier, *var. nov.* TYPE: U.S.A. Texas: Val Verde Co., On Highway 277 north of Del Rio, 1.1 miles south of intersection of 277 & 377, abundant in bar ditch on east side of road, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2757* (HOLOTYPE: TEX-LL; Isotypes: TAES,BRIT)
*Anemone okennonii* Keener & Dutton, Sida 16(1):191-202. 1994.

*Anemone tuberosae* Rydb. var. *tuberosae* similis sed segmentis ultimis bracteorum involucralium linearibus integribusque differt.

Slender perennial herb, 4-30 cm tall at anthesis, from oblong or clavate tuberous rootstocks; radical leaves petiolate, 1-2 ternate, acute-tipped, 2-4 cleft, cuneate at the base; peduncle typically branched above the involucral bracts, appressed pubescent above the bracts and glabrate below; involucral bracts sessile, palmatifid into linear or oblong acute segments; flowers (1) 2 (3) per peduncle, the first peduncle naked,

subsequent ones involucellate; sepals 6-12, oblong-oval obtuse, often with retuse tips; pink, white, or white with pink streaks on the outer side, 0.5-1.9 cm long, pubescent on the outer side; fruiting head ovoid to cylindrical, 1.5-3.5 cm long; achenes tomentose, styles violet-purple, filiform, about 1/3 the length of the achene.

February to April. Rocky slopes to grassy flats, predominantly over limestone. In Texas, from El Paso County east to Kimble County; also in northern México.

Specimens examined:

MEXICO. Coahuila: Rio Grande, Tule Canyon, on Coahuila side above Upper Madison Falls, 10 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang C. 10614* (TEX-LL). Nuevo León: Monterrey, 9 Mar 1923, *B.C. Tharp 1800* (TEX-LL); On "M" ridge side above San Pedro, Monterrey, 5 Feb 1961, *R. F. Smith M338* (TEX-LL); Rocky hillside 3.7 mi W of Bustamante, 4 Feb 1983, *C. Cowan 3782* (TEX-LL); Villaldama, Mountains E of state highway 34, 1.4 km N of junction to Bustamante, 15 Mar 1983, *C. Cowan 3809* (TEX-LL)

U.S.A. New Mexico: Eddy Co., Carlsbad Caverns Natl. Park, 19 Apr 1977, *T.L. Burgess 4476* (TEX-LL). Texas: Brewster Co., E slope of Pulliam above Moss Well at Big Bend National Park, 21 Mar 1967, *Barton Warnock 21142* (SRSC); Glass Mts., hills in back of Jim Nichols ranch house, 9 Mar 1947, *Barton Warnock 47007* (SRSC); Alpine, 20 Mar 1937, *Barton Warnock T205* (SRSC, TEX-LL); Pine Mt., about 12 mi E of Alpine, 19 Mar 1938, *B. Peyton & Barton Warnock T439* (SRSC); Dog Canyon, Big Bend Natl Park, 8 Apr 1958, *Barton Warnock & M. Johnston 15986* (SRSC); Lowest foothill slopes, Glass Mts., 21 Mar 1941, *Reg. Rose-Innes & Barton Warnock 565* (BRIT,TEX-LL); Chisos Mts., 15 Mar 1941, *Barton Warnock 442* (TEX-LL). Crockett Co., 14.8 mi W of Ozona, 14 Mar 1949, *B.L. Turner & Barton Warnock 273* (SRSC,BRIT,TEX-LL); Hwy 290, 1 mi E of Pecos River bridge, 9 Apr 1964, *J. Read 572* (SRSC); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 26 Feb 1995, 50 to 500 yds S of park under top of west-facing rim, 26 Feb 1995, *M. Enquist 2710* (TEX-LL,BRIT, TAES); On 290, at roadside park at top of Lancaster Hill, Ft. Lancaster, 5 Mar 1995, *M. Enquist & B. Crozier 2733* (TEX-LL); W side of Pandale Road, 24.4 mi N of int. of 1024 & Pandale Road, 12 Mar 1995, *M. Enquist & B. Crozier 2734* (TEX-LL, BRIT,TAES,MO,SRSC). Culberson Co., Victorio Canyon, E margin of Sierra Diablo, 18 Apr 1973, *M.C. Johnston, T.L. Wendt, & F. Chiang 10686* (TEX-LL). Edwards Co., Rock knob 14.2 mi NE of int. of 277 & 377, 4 Mar 1995, *M. Enquist & B. Crozier 2724* (TEX-LL,BRIT,TAES,MO,SRSC,NMC); On 2523, 1.7 mi N of Edwards/Kinney Co. line at long roadcut, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2750* (TEX-LL,BRIT,TAES). Kimble Co., On 385, 1.35 mi S of Llano River, E side of road on low roadcut through nodular limestone, 2 Apr 1995, *M. Enquist 2776* (TEX-LL,BRIT,TAES,MO,SRSC,NMC); On 385, E side of road on low roadcut through nodular limestone, plants heavily attacked by black rust, 9 Apr 1995, *M. Enquist 2790* (TEX-LL,BRIT,TAES,MO,SRSC,NMC); On 385, low roadcut to drainage, 3.2 mi S of Llano River, 17 Apr 1995, *M. Enquist & B. Crozier 2804* (TEX-LL,BRIT,TAES,MO,SRSC,NMC); On 377, S of Junction, 0.3 - 0.4 mi N of first crossing of the Llano River, W side of curve, 2 Apr 1995, *M. Enquist 2780* (TEX-LL,BRIT,TAES,MO,SRSC,NMC). Pecos Co., Along Sanderson hwy 10-18 mi out of Ft. Stockton, 5 Apr 1953, *J. Scuddy 133* (SRSC); Along hwy 20 mi NE of Ft. Stockton toward McCamey, 27 Apr 1947, *Barton Warnock 5199* (SRSC,BRIT,

TEX-LL); N side of Sierra Madera range, 24 mi S of Ft. Stockton, 12 Apr 1947, *Barton Warnock 5064* (SRSC); 13.5 mi E of Ft. Stockton along hwy 290, 17 Apr 1965, *D.S. Correll & H. B. Correll 30884* (TEX-LL); On mesa N of Tunis Spring, about 19 mi E of Ft. Stockton, 5 Apr 1965, *D.S. Correll, H. B. Correll, & L. Benson 30844* (TEX-LL); Off US 67, E of Ft. Stockton, 15 Apr 1941, *C.L. Lundell & A.A. Lundell 10176* (TEX-LL). Sutton Co., on 189, SW corner of county, 0.8 mi NE of int. of 189 & Co. Rd. 410, 12 Mar 1995, *M. Enquist & B. Crozier 2741* (TEX-LL, BRIT,TAES); On 277, 4.3 mi S of int. of 277 & Loop 476 in Sonora, 19 Mar 1995, *M. Enquist & B. Crozier 2746* (TEX-LL,BRIT,TAES). Terrell Co., 13 mi W of Sanderson, 28 Mar 1947, *Barton Warnock 47083* (SRSC); 4.2 mi W of Sanderson, 14 Mar 1949, *B.L. Turner & Barton Warnock 319* (SRSC,BRIT); 31 mi S of Sheffield, 14 Mar 1949, *B.L. Turner & Barton Warnock 307* (SRSC,BRIT); 5 mi E of Dryden on US 90, 30 Mar 1950, *H.L. Surrat 179* (SR); 8 mi E of Dryden, 28 Mar 1947, *Barton Warnock 47107* (SRSC). Uvalde Co., Uvalde, common on sandy hills and prairies, 28 Feb 1919, *H.C. Hanson s.n.* (TEX-LL). Val Verde Co., 20 mi N of Langtry, 30 Mar 1947, *Barton Warnock & G.W. Brown 47301* (SRSC); Hills above dam at foot of Devils Lake, about 20 mi NNW of Del Rio, 31 Mar 1947, *R. McVaugh 7729* (BRIT,TEX-LL); 1.1 mi S of int. of 277 & 377, 25 Mar 1995, *M. Enquist, B. Crozier, & B.L. Turner 2757* (TEX-LL,BRIT,TAES,MO); 1.1 mi S of int. of 277& 377, 17 Apr 1995, *M. Enquist & B. Crozier 2802* (TEX-LL,BRIT,TAES); Low, curving roadcut on 1024, 6.8 mi E of int. of 1024 and Pandale Rd in Pandale, 5 Mar 1995, *M. Enquist & B. Crozier 2730* (TEX-LL,BRIT,TAES,MO,SRSC,NMC); County road to Juno at its int. with 1024, 12 Mar 1995, *M. Enquist & B. Crozier 2738* (TEX-LL); Loma Alta, 0.2 - 0.3 mi N of Loma Alta on E side of 277, 4 Mar 1995, *M. Enquist & B. Crozier 2727* (TEX-LL,BRIT,TAES,SRSC,NMC); E side of Pandale Road, 4.8 mi S of Pecos River crossing in narrow strip of grass along road, 12 Mar 1995, *M. Enquist & B. Crozier 2737* (TEX-LL); On 189, 0.8 mi S of Buckley's Crossing, 19 Mar 1995, *M. Enquist & B. Crozier 2747* (TEX-LL,BRIT, TAES,MO,SRSC,NMC); On 1024 to Pandale ca. 3 mi N of Junction with US 90 in Comstock, 14 Mar 1985, *B. Ertter & K.A. Bear 5601* (TEX-LL).

## KEY TO TEXAS SPECIES OF *ANEMONE*
(adapted from Keener & Dutton 1994)

1. Plant spreading by rhizomes or stolons, involucre below middle of scape at anthesis; scape nearly glabrous below involucre; involucral bracts similar to at least some of the radical leaves; styles as long or longer than the ovoid achenes. ..... .....1. *A. caroliniana*

1. Plant without rhizomes or stolons, involucre above middle of scape at anthesis; scape glabrous to pubescent below involucre, involucral bracts dissimilar or similar to radical leaves; styles less than half as long as the orbicular, flat achenes.. .....(2)

2. Scape simple, bearing one flower; involucral bracts distinctly dissimilar to radical leaves; scape densely pubescent below involucre. .....2. *A. berlandieri*

2. Scape usually branched, bearing two or more flowers per stem; involucral bracts similar or dissimilar to radical leaves; scape nearly glabrous to glabrous below involucre. .....(3)

3. Leaves 1 (-2) ternate; flowers white; translucent styles colorless to yellow-green. .....3. *A. edwardsiana*
3. Leaves (1-) 2 ternate; flowers white to pink; translucent styles pale lavender to purplish-red. ..... 4. *A. tuberosa*

## CONCLUSION

We conclude that the label data on type material of the O'Kennon collections are inaccurate and probably reflect confusion as to where the type specimens of *Anemone okennonii* were actually collected. Because of this, and because we recognize the taxon at a lower rank, we here redescribe it with a different name and better typification. Although we are aware that the *International Code of Botanical Nomenclature* recommends the retention of any name which might be replaced in a change of rank, we believe the broader systematic community is better served by the nomenclature provided here as to the geography to which it is largely confined, its inextricable relationship with *A. tuberosa*, and by the precise typification.

## ACKNOWLEDGMENTS

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*Phytologia* (June 1995) 78(6):446-447.

# *PARONYCHIA VIRGINICA* (CARYOPHYLLACEAE), A FIRST REPORT OF ITS OCCURRENCE IN MEXICO

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

*Paronychia virginica* Spreng. is widespread in the eastern U.S.A. but has not previously been reported for México, although it is relatively common in central Texas. Recent collections by D.H. Riskind from the Serranias del Burro, Mpio. Villa Acuña, Coahuila, México has extended its distribution about 300 kilometers southwestwards from its previously known range. A map showing its distributions in Texas and México is provided.

KEY WORDS: Caryophyllaceae, *Paronychia*, Texas, México

Routine identification of plants from northern México has revealed the occurrence of *Paronychia virginica* Spreng. in México, where it has not heretofore been reported. All of the collections (3 sheets) were made by Mr. David H. Riskind, in the Serranias del Burro, Mpio. de Villa Acuña, Rancho el Bonito (ca. 29° 01′ 30″ N, 102° 07′ 30″ W), as follows:

1. Canyon El Toro, 18 Sep 1977, *R. 2142* (TEX).
2. Head of Canyon El Bonito, plateau of open pine-oak woodland, 2300 m, 20 Sep 1977, *R. 2263* (TEX).
3. Open slope between canyons El Bonito and Pantera, 20 Sep 1977, *R. 2286* (TEX).

Figure 1 shows the distribution of *Paronychia virginica* in Texas and México. This is based upon collections from Texas as reported in Turner (1983. Phytologia 54:9-23.) and upon collections assembled at LL, TEX since that time.

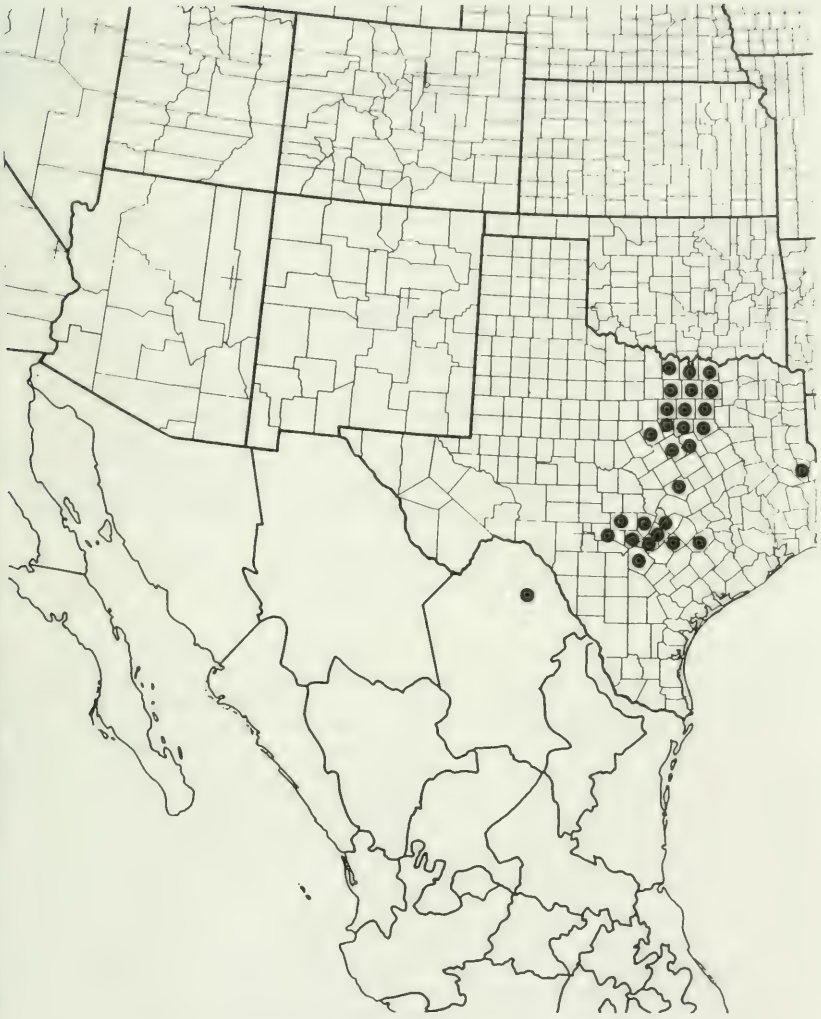

Fig. 1. Distribution of *Paronychia virginica* in Texas and Mexico.

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# SYNOPTICAL STUDY OF *RHODODON* (LAMIACEAE)

B.L. Turner

Department of Botany, University of Texas, Austin, Texas 78713 U.S.A.

ABSTRACT

*Rhododon*, endemic to Texas, is treated as having two species: *R. ciliatus* (Benth.) Epling, and ***R. angulatus*** (Tharp) B.L. Turner, *comb. nov.* The latter taxon was originally positioned in the genus *Stachydeoma* by Tharp in 1945 after the erection of *Rhododon* by Epling in 1939. Tharp was unaware of Epling's establishment of *Rhododon*, typical elements of which had previously resided in *Stachydeoma*. A key to the two species of *Rhododon* is provided, along with complete synonymies and maps showing the distribution of each.

KEY WORDS: Lamiaceae, *Rhododon, Stachydeoma, Hedeoma*, Texas

*Rhododon* was established as a monotypic genus by Epling in 1939. The type species, *R. ciliatus* (Benth.) Epling, was originally described by Bentham as *Keithia ciliata* Benth., based upon material collected in Texas by Berlandier in 1828. Bentham (Nov. 1848) subsequently transferred the species to *Hedeoma* where it was retained as *H. ciliata* (Benth.) Benth. *ex* DC., in spite of the existence of *H. ciliata* Nutt. (Apr. 1848), which occasioned the replacement name, *H. texana* Cory, in 1936. Earlier, however, Small in 1903 had transferred *Keithia ciliata* into his newly erected *Stachydeoma*, which apparently contained two disparate elements, neither of which was selected by Small to typify his genus. Epling (1939) corrected this oversight with the erection of *Rhododon*, typifying *Stachydeoma* with *S. graveolens* (Chapm.) Small, a Floridean endemic.

Tharp (1945), when undertaking his study of *Stachydeoma* for Texas, was unaware of Epling's *Rhododon* and maintained three taxa within *Stachydeoma, S. ciliata* and two newly described species, *S. angulata* Tharp and *S. duvalii* Tharp. Subsequent workers have more or less ignored *Rhododon*, although Irving (1980) excluded *R. ciliata* from his concept of *Hedeoma*, in effect accepting Epling's *Rhododon*, but treating this as monotypic, in spite of Tharp's two newly described species, both of which Irving thought synonymous with *R. ciliatus*.

I have gone over the *Rhododon* problem in some detail, studying specimens of the genus both in herbaria and in the field. My treatment recognizes *Rhododon* as distinct from *Stachydeoma*, accepting two species, *R. ciliatus* (including *S. duvalii*) and *R. angulatus*, the former occupying deep sandy soils in east central Texas, the latter occurring in coastal relic dunes in southern Texas, as shown in Figure 1.

A key to the species follows, along with brief descriptions and complete synonymies.

1. Midstem leaves broadly ovate to ovate-elliptic, mostly 1.5-2.0 times as long as wide; calyx lobes merely ciliate, their surfaces essentially glabrous, the marginal hairs mostly 0.5 mm long or less; flowers arranged in interrupted spikes; coastal relic dunes in southernmost Texas. ..... *R. angulatus*
1. Midstem leaves elliptic to oblanceolate, mostly 2.0-3.5 times as long as wide; calyx lobes pubescent both along their margin and upon their surfaces, the hairs, at least some or most of them 1-2 mm long; flowers usually arranged in dense spikes, rarely interrupted; east-central Texas. ..... *R. ciliatus*

***RHODODON ANGULATUS*** (Tharp) B.L. Turner, *comb. nov.* BASIONYM: *Stachydeoma angulata* Tharp, Brittonia 5:304. 1945. TYPE: U.S.A. Texas: Aransas Co., Rockport, 2 Jul 1939, *B.C. Tharp 43991* (HOLOTYPE: TEX!).

Tharp (1945) provided an adequate description of this species, along with a photograph of the holotype. He also constructed a key to the several taxa recognized, but emphasized in this several characters which I have not drawn upon.

*Rhododon angulatus* is a rarely encountered taxon. I visited the type locality in May of 1994 to ascertain its relative commonness in the area concerned. As indicated in the specimens cited below, I first collected the species in June of 1964, 5 miles north of Aransas Pass, growing upon large stabilized sand dunes along the east side of state highway 35. At that time I encountered only two plants in the immediate vicinity, both growing upon the dunes concerned. My revisit to this site in 1994 was most disappointing, for all of the prominent dunes along the roadway had been leveled for highway expansion and commercial development.

I did, however, locate *Rhododon angulatus* in similar dune sands along the roadway that circles the Aransas County airport, about 1 km west of the earlier site. None of the plants was in flower at the time, but I counted several hundred or more over an acre or less, nearly all in deep sandy soils among and upon seemingly stabilized dune sands. Since the relic dunes in this region harbor a number of interesting plants, especially *Rhododon angulatus*, some effort should be made by conservancy agencies to protect at least a few such areas.

ADDITIONAL SPECIMENS EXAMINED: U.S.A. Texas: Aransas Co., "On sandy bank south of Aransas County Airport," 8 Jul 1957, *Correll & Johnston 17613* (LL); 5 mi N of Aransas Pass, roadside, growing in live oak mott, 16 Jun 1964, *Turner 5030* (TEX).

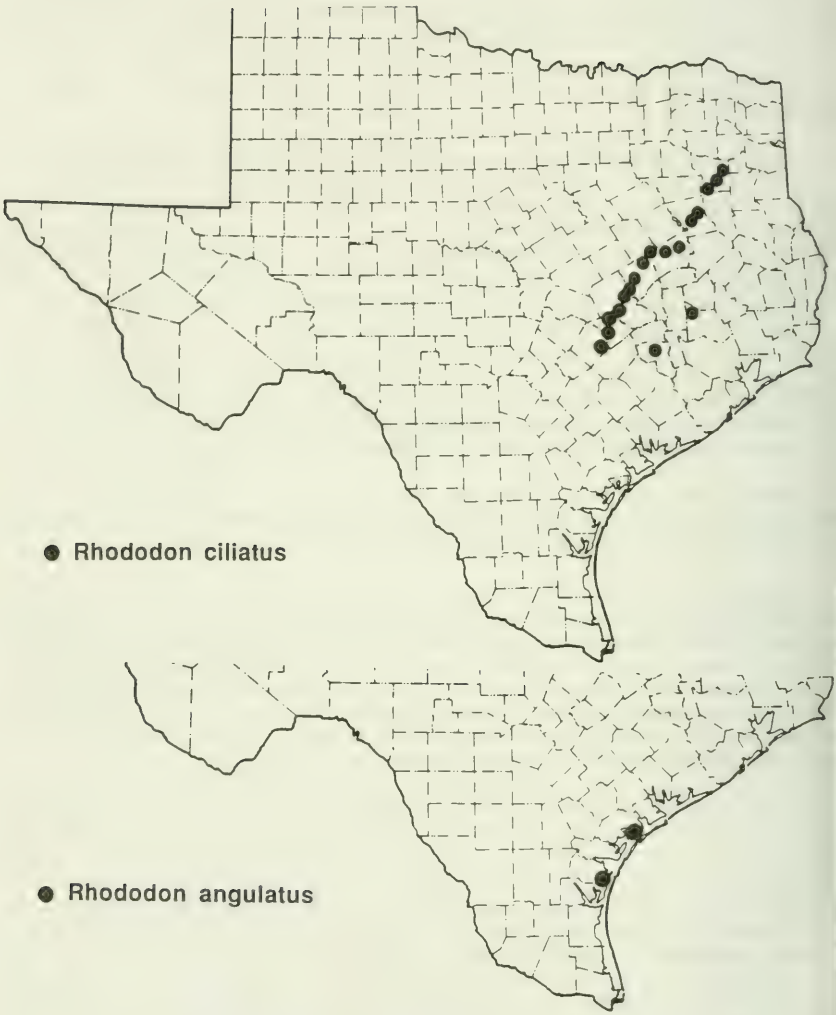


Fig. 1. Distribution of *Rhododon* spp. Upper map, *R. ciliatus*; lower map, *R. angulatus* (based upon records at BRIT, LL, TEX).

*RHODODON CILIATIS* (Benth.) Epling, Rep. Spec. Nov. Beih. 115:14. 1939. ≡*Hedeoma ciliata* (Benth.) Benth. *in* DC., *Prodr.* 12:245. Nov 1848. [not *H. ciliata* Nutt.]. ≡ *Stachydeoma ciliata* (Benth.) Small, *Fl. S.E. U.S.* 1041. 1903, 1937. ≡*Hedeoma texana* Cory, Rhodora 38:405. 1936. TYPE: U.S.A. Texas: w/o county, 1828, *Berlandier s.n.* (HOLOTYPE: K).

*Stachydeoma duvalii* Tharp, Brittonia 5:306. 1945. TYPE: U.S.A. Texas: Austin Co., 4 mi NW of Bellville, 22 Jun 1923, *B.C. Tharp 43992* (HOLOTYPE: TEX!).

This taxon has been adequately described by Tharp (1945). He separated from this, however, material collected in Austin County having interrupted spikes (the latter character approaching that of *Rhododon angulatus*), calling this *Stachydeoma duvalii*. Except for the interrupted spikes, nearly all of the characters of the latter are those of *Rhododon ciliatus* and I have little hesitancy in treating these as synonymous.

*Rhododon ciliatus* is linearly widespread and abundant in eastcentral Texas, where it is largely restricted to the deep white sandy soils of the Carrizo formation (*cf.*, McBryde 1933), although occasional populations occur elsewhere, as shown in Figure 1.

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